China's far below replacement level fertility:

A reality or illusion arising from underreporting of births?

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Declaration

Except where stated otherwise, this thesis is my own work carried out during my PhD study from July 2002 to October 2004 at the Australian National University.

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Abstract

How fast and how far China's fertility declined in the 1990s has long been a matter of considerable debate, despite very low fertility consistently being reported in a number of statistical investigations over time. Most demographers interpreted this as a result of serious underreporting of births in population statistics, due to the family planning program, especially the program strengthening after 1991. Consequently, they suggested that fertility fell only moderately below-replacement level, around 1.8 children per woman from the early 1990s. But some demographers argued that surveys and census may have reflected a real decline of fertility even allowing for some underreporting of births, given the consistency between data sources and over time. They believed that fertility declined substantially in the 1990s, very likely in the range between 1.5 and 1.6 by the year 2000.

The controversy over fertility is primarily related to the problem of underreporting of births, in particular the different estimations of the extent of underreporting. However, a correct interpretation of fertility data goes far beyond the pure numbers, which calls for a thorough understanding of different data sources, the programmatic and societal changes that occurred in the 1990s, and their effects on both fertility changes and data collection efforts. This thesis aims to address the question whether the reported far-below-replacement level fertility was a reality of substantial fertility decline or just an illusion arising from underreporting of births. Given the nature of the controversy, it devotes most efforts in assessing data quality, through examining the patterns, causes and extent of underreporting of births in each data source; reconstructing the decline of fertility in the 1990s; and searching corroborating evidence for the decline.

After reviewing programmatic changes in the 1990s, this thesis suggests that the program efforts were greatly strengthened, which would help to bring fertility down, but the birth control policy and program target were not tightened as generally believed. The program does affect individual reporting of births, but the completeness of births in each data source is greatly dependent on who collects fertility data and how the data are collected. The thesis then carefully examines the

data collection operations and underreporting of births in five sets of fertility data: the *hukou* statistics, the family planning statistics, population census, annual survey and retrospective survey. The analysis does not find convincing evidence that fertility data deteriorated more seriously in the 1990s than the preceding decade. Rather, it finds that surveys and censuses have a far more complete reporting of births than the registration-based statistics, because they directly obtain information from respondents, largely avoiding intermediate interference from local program workers. In addition, the detailed examination suggests that less than 10 percent births may have been unreported in surveys and censuses. The annual surveys, which included many higher-order our-of-plan births being misreported as first-order births, have more complete reporting of births than censuses, which were affected by the increasing population mobility and field enumeration difficulties, and retrospective surveys, which suffered from underreporting of higher-order births.

Using the unadjusted data of annual surveys from 1991 to 1999, 1995 sample census and 2000 census, this research shows that fertility first dropped from 2.3 to 1.7 in the first half of the 1990s, and further declined to a lower level around 1.5-1.6 in the second half of the decade. The comparison with other independent sources corroborates the reliability of this estimation. Putting China's fertility decline in international perspective, comparison with the experiences of Thailand and Korea also supports such a rapid decline. Subsequently, the thesis reveals an increasingly narrow gap between state demands and popular fertility preferences, and great contributions from delayed marriage and nearly universal contraception. It is concluded that the fertility declined substantially over the course of the 1990s and dropped to a very low level by the end of last century. It is very likely that the combination of a government-enforced birth control program and rapid societal changes quickly moved China into the group of very low-fertility countries earlier than that might have been anticipated, as almost all the others are developed countries.

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List of Abbreviations

ASFR	Age-specific fertility rate
CBR	Crude birth rate
CEB	Children ever born
CPA	China Population Association
CPC	Communist Party of China
CPIRC	China Population Information and Research Centre
CPR	Contraceptive prevalence rate
CSSA	China Social Science Academy
DRHS	Demographic and Reproductive Health Survey
HDI	Human Development Index
ISI	International Statistical Institute
IUD	Intra-uterine devices
IDFS	In-Depth Fertility Survey
MAB	Mean age at first birth
MAM	Mean age at first marriage
MOE	Ministry of Education
MOH	Ministry of Health
MPS	Ministry of Public Security
NIR	Natural increase rate
QOC	Quality of Care
SFPC	State Family Planning Commission
SMAM	Singulate mean age at marriage
SRB	Sex ratio at birth
SSB	State Statistical Bureau
TFR	Total fertility rate
TDFR	Total duration-specific fertility rate
UN	United Nations
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Chapter 1 Introduction

China's fertility has declined very quickly since the early 1970s, when the nationwide family planning program was introduced. A collection of surveys and census conducted in the 1980s, as well as the 1990 census, well documented this remarkable change; this has been widely accepted with confidence. From the early 1990s, a number of surveys and the 2000 census continually reported a continued decline of fertility to a very low level at the turn of this century. Although most demographers believed that fertility fell below-replacement level in the early 1990s, there was much controversy on the magnitude and speed of fertility decline over the decade. This thesis examines fertility levels for the 1990s, and raises the question of whether the reported far-below-replacement level fertility was genuine, or just an illusion arising from underreporting of births.

The controversy over fertility levels results from increasing concerns over the quality of fertility data among demographers and policy makers. It is believed that all statistical investigations have been subject to underreporting of births owing to the effects of the family planning program, and this situation became worse because of the program strengthening since the early 1990s. But there was no agreement over how to estimate the extent of underreporting of births with precision, which resulted in a decade-long debate about levels and trends of fertility.

Evidently, fertility estimation is determined by the different estimations of the extent of underreporting. However, a correct interpretation of fertility data goes far beyond the pure numbers. While the family planning program contributes to changes in fertility preferences and behaviour, it also greatly affects different data collection operations. The rapid socio-economic development also exerts influences on both sides. Thus, fertility estimation calls for a thorough understanding of the interwoven relationship between the programmatic and societal changes and their effects on both fertility changes and data collection efforts.

1.1 Research background

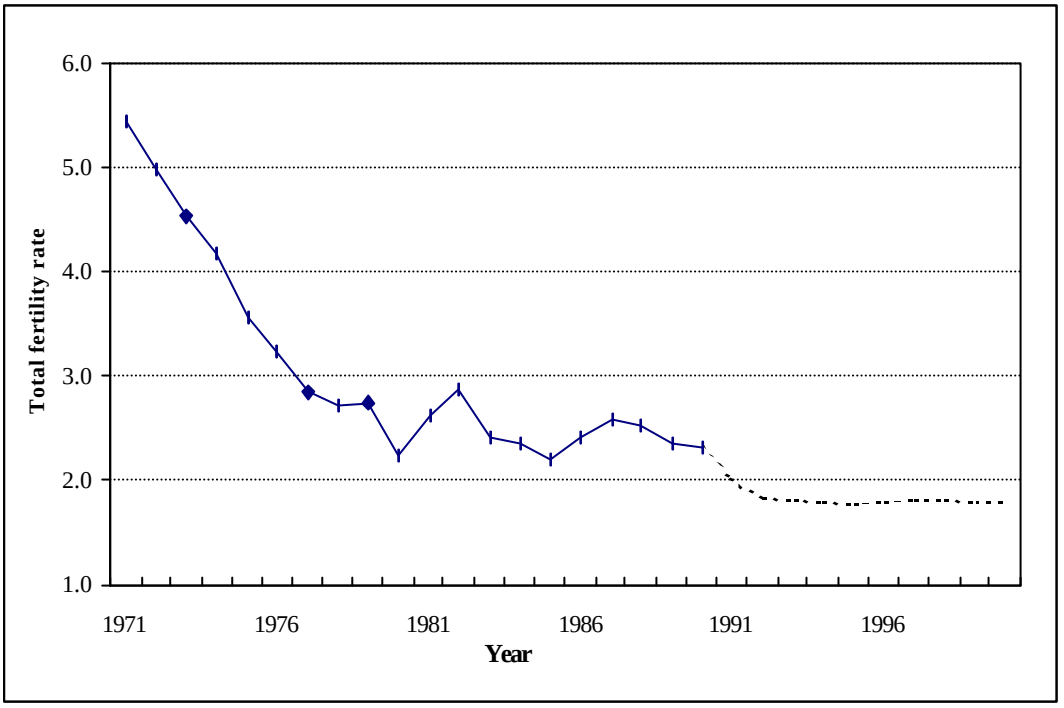
Before going into the details in the 1990s, it is necessary to review both the family planning program and fertility changes since the early 1970s. In this thesis, the program refers to both the policy and its implementation. It is important to note that the family planning policy remained stable during the 1990s, after experiencing tightening and relaxation before the mid-1980s, while the policy implementation was greatly strengthened in the 1990s in contrast to the weak performance in the 1980s.

1.1.1 Levels and trends of fertility since the early 1970s

From the early 1950s to the late 1960s, China's demographic experiences were similar to those of most other developing countries. There was rapid population growth following a sudden decline in mortality in the absence of decline in fertility for decades. The total fertility rate (TFR) is the most commonly used demographic measurement to reflect the levels and trends of fertility; it means the average number of children a woman would have subject to fertility rates by age in a given period. It was reported that the total fertility was above six children per woman in most years from 1950 to 1970, except in the period of the Great Famine, 1959-1961, and the starting stage of the Cultural Revolution, 1966-1976 (Kane 1987; Peng 1991b).

Figure 1.1 presents the total fertility series from 1971 to 2000. During the 1970s, China's fertility experienced a dramatic reduction from almost six children per woman to just under three along with the implementation of the nationwide family planning program. It approached replacement level with a total fertility of 2.2 in 1980, indicating the possibility of reaching below-replacement fertility, had the pace of decline in previous decade been maintained (Coale and Chen 1987). However, contrary to the government's expectations of a further reduction in fertility when introducing a stricter one-child family planning policy, fertility in the 1980s fluctuated above replacement level, ranging from 2.86 in 1982, to 2.20 in 1985, 2.49 in 1987 and 2.35 in 1989 (Feeney et al. 1989; Yao and Yin 1994). At least in the early 1990s, it seemed unlikely that fertility would go below replacement level.

Figure 1.1 Total fertility rates in China, 1971-2000



Sources: The 1971-90 series are from Yao and Yin (1994); 1991-2000 series are from the SFPC (2001).

Note: The 1991-2000 series from the SFPC have already been adjusted for underreporting of births.

Nonetheless, the 1990s witnessed another round of recorded fertility decline. The official estimates of demographic change from the State Statistical Bureau (SSB) indicated that the annual crude birth rate (CBR) kept going lower and the natural increase rate (NIR) had been below one percent from 1998 onwards (SSB 1991-2002). In fact, these official estimates had already been inflated to account for 'sampling and investigation errors' on the basis of the annual population change survey (hereafter the annual survey), implying a much lower level of fertility reported in the surveys. However, how fast and far the true fertility rate fell in the 1990s has been a subject of disagreement. The dotted line from 1991 to 2000 in Figure 1.1 represents the official published estimates of the State Family Planning Commission (SFPC) based on the SSB official estimates of crude birth rates (SFPC 2001). It is not clear whether the SFPC inflated the TFR estimates further, but even allowing for the SSB inflation alone, the SFPC estimates still indicated that the published fertility estimates were below replacement level over the entire decade.

1.1.2 The family planning program since the early 1970s

The ‘one-child policy’ is perhaps the most frequently used term in Western media reports and many academic studies to describe China’s family planning program. Although it reflects the core parity-specific feature of the program, it is too simple and often gives rise to unnecessary confusion. As a matter of fact, the nationwide program in the 1970s did not strictly impose limitations on the number of children that each couple was allowed to bear. Instead, it focused on the promotion of later marriage, later childbearing, and fewer births with longer birth spacing, known as a later-longer-fewer policy (*wan xi shao*) (Croll, Davin and Kane 1985; Kane 1987). The Chinese government mobilised its propaganda and administrative apparatus and millions of grassroots program workers to implement family planning with free contraceptives and family planning operations. The programmatic success was substantial in halving the fertility from 1970 to 1979 (Coale and Chen 1987).

In the late 1970s when the post-Mao leaders began the reform-and-open-up policy, the huge population size and rapid growth were considered as the primary obstacle to economic development and modernisation. The anticipation of large cohorts, the baby boomers of the 1960s, entering marriageable age in the following decade greatly increased the risk awareness among policy makers. In late 1979, the Chinese government dramatically tightened the family planning policy, requiring each couple to have only one child, except in minority ethnic groups or the Han majority with certain strict conditions (Croll, Davin and Kane 1985; Scharping 2003; Wang and Hull 1991). The program target was set to limit the population to 1.2 billion in the year 2000. The National People’s Congress revised the Constitution in 1978 and the Marriage Law in 1980 to include articles that require citizens to practise family planning.

To co-ordinate the national family planning efforts and enforce the policy, the State Family Planning Commission was established at the central level in 1981. Meanwhile, family planning commissions at the provincial, prefecture, county and township levels were also established. They form a nationwide family planning network, and work through special groups or persons in charge of family planning at

the grassroots level, the urban residents' committees and rural villages, to extend influences directly to each individual couple. The program also establishes a series of administrative and economic incentives for couples who obey the policy and disincentives for couples who violate the policy.

While the strict family planning policy has been well implemented in urban areas since 1979, its implementation in rural areas encountered strong resistance, as most rural couples were determined to have more than the permitted number of children, or at least one son. It was reported that rural couples employed as many strategies as they could to achieve their reproductive goals, including temporary migration, negotiation or physical violence against local cadres, and concealment of out-of-plan births (Banister 1987; Greenhalgh 1994; White 1991). This situation not only made the family planning program hard to implement, but also was considered detrimental to the legitimacy of governance (White 1994).

In April 1984, the Chinese government decided to modify the rural policy to include more exceptions for rural couples to have a second child, of which the most important was the first child being a girl; others included living in mountain areas, and both members of a couple being from single-child families, etc (Greenhalgh 1986; Zeng 1989). Meanwhile, it also amended the program target to limiting total population to 1.25 billion by the year 2000 (Li 2000). However, the sudden policy change not only created confusion and frustration among local program workers, who became reluctant to enforce the policy, but also convinced peasants that the policy was volatile, so they subsequently entered into marriage and childbearing as soon as possible. Consequently, there was a larger than expected upsurge of births from the mid-1980s (Feeney et al. 1989; Zeng et al. 1991). It was then found that that the peasants commonly had two children, or even three in remote areas, despite the fact that the policy modification only allowed about half the peasants to have a second child (Gu 1996: 75).

It took several years for the central and provincial governments to consolidate the program after 1984. Some observers believed that the policy was tightened, but others disagreed with this interpretation (Hardee-Cleaveland and Banister 1988; Zeng 1989). In fact, the new SFPC leadership after 1988 realised that the program

problems did not result from relaxation of the policy, but from the weakening of its implementation at the basic level (Wang and Hull 1991; White 1991; Winckler 1999). From then on, the SFPC began to emphasise the need to 'stabilise the current policy' (*wending xianxing zhengce*), while gradually strengthening the program efforts at the basic levels (Li 2000). The most important measures were taken in 1991 when the 1990 census results made clear the program's incompetence in the late 1980s. The Party Central Committee and the State Council issued an important directive, the 'Decision on strengthening the family planning program for effective control of population growth' on 12 May 1991 (hereafter the 1991 Decision). The 1991 Decision not only continued the family planning policy after the 1984 relaxation, but more importantly, stipulated a number of measures which should be taken by the governments at all levels to strengthen the program efforts; this is described in detail in Chapter 2.

During the 1990s, the family planning policy was embodied in a combination of state guidelines and provincial regulations, because the legislation for a national family planning law had to be postponed owing to strong regional disparities. The 1991 Decision stated the general guidelines at the national level:

> The current family planning policy in our country is: to promote late marriage, late childbearing, fewer births and healthier births; to advocate each couple to have only one child. Except for some special conditions and with permission, state officials, workers and urbanites, each couple has only one child. It is also promoted that each couple have only one child in rural areas, unless some with special difficulties with permission could have the second after several years spacing... (CPC Central Committee and State Council 1991)

By the end of 1991, 28 out of the 30 provinces except for Tibet and Xinjiang, the two large minority Autonomous Regions, had promulgated new provincial regulations or revised previous ones. These provincial regulations stipulated the practical requirements in family planning including the timing of marriage and childbearing, birth spacing, and number of children (Feng and Hao 1992). Some demographers estimated the fertility level required by the policy as 1.62 at the national level, considering the policy requirement and the population composition of rural-urban proportion, ethnic groups, etc. (Feeney and Wang 1993; Zeng 1989). Very recently, a

group of demographers made a more careful estimation, which used a refined analysis unit at the county level rather than at the provincial level, and estimated that the policy-required fertility was 1.47 at the national level (Guo et al. 2003).

Over the course of the 1990s, the SFPC kept emphasising the need to stabilise the current policy to dampen any expectations of further policy relaxation, and pushed provincial governments to greatly strengthen the program efforts, from increase in funding, personnel, and technical services to expansion of incentives and disincentives (Greenhalgh and Winckler 2001). From the mid-1990s, the SFPC began a gradual and cautious shift in program priority from family planning alone to broader aspects including reproductive health service, in response to the recommendations of the International Conference on Population and Development (ICPD) held in Cairo in 1994. This program reorientation offered clients more contraceptive choice and reproductive health service, highlighting the Quality of Care, with assistance from AusAID, UNFPA, the Rockefeller Foundation, the Ford Foundation and other international organisations (Gu 2000; Gu, Simmons and Szatkowski 2002; Smith et al. 1997; Zhang et al. 1996). Increasingly, these reforms not only changed the image of the program, but also were conducive to the compliance of individual couples (Greenhalgh and Winckler 2001).

In 2000, the central authority issued another decision to ‘stabilise the low fertility’ (CPC Central Committee and State Council 2000), and in 2001 a Population and Family Planning Law was enacted, which took effect after 1 September 2002. Despite some changes, such as widely permitting both-single-child couples to have two children, and highlighting the delivery of quality service, the essence of the family planning program remains (Winckler 2002).

1.1.3 Knowledge on China’s fertility decline in the new millennium

The rapidity of fertility decline in China since the early 1970s attracts wide attention, and the unique feature of government enforcement has often singled China out in the developing world (Peng 1991b). There have been numerous papers and books to explore the determinants of the rapid fertility decline, and most of them have

highlighted the important contribution of the family planning program, while also acknowledging the role of socio-economic development (see Riley and Gardner 1997; Yu and Xie 2000).

Some studies highlight the important role of the family planning program in fertility reduction. For example, Wolf (1986) suggested that the government had played an 'preeminent' role in China's fertility decline, but his argument excluding socio-economic factors was not well-received. Other analyses objectively examined the role of the family planning program. For example, one analysis found a negative association of the level of education and urbanisation with marital fertility in both urban and rural China before the initiation of the substantial family planning programs. However, it was found that the programatic effects on fertility overwhelmingly exceeded these weak socio-economic effects (Lavely and Freedman 1990). Another study examined the changes in parity progression ratios from the 1960s to the late 1980s, and suggested that the family planning program actually hastened the fertility decline, and may account for over half of the decline (Feeney and Wang 1993: 95).

On the other hand, some demographers acknowledged that China's success in fertility decline was the result of government-directed family planning program, but argued that socio-economic factors were also similarly instrumental as in the fertility declines of other countries. For example, Tien (1984) observed that the variability among China's subregions suggests that the areas experiencing the greatest reductions in fertility might also be characterised by profound changes in socio-economic structure. Poston and Gu (1987) examined in detail and confirmed the relationships between socio-economic development, family planning, and fertility among the 28 subregions of China around 1982. In one recent paper, Poston (2000) used subregional data from the counties and cities from the mainland of China and from Taiwan from the early 1980s to the mid-1990s to examine the relationship between socio-economic development and fertility transition. His cross-sectional examinations showed consistent and pervasive negative associations between development and levels of fertility.

In general, most demographers tended to acknowledge the contributions of both programmatic and socio-economic factors. It was suggested that while the official program could change the fertility behaviour of women in a very dramatic way for a while, further fertility decline in China, and the completion of the fertility transition as well, were more likely to occur gradually and in line with socio-economic development (Peng 1989). Some further pointed that these two factors were actually 'inextricably intertwined' in the case of China and it was impossible to separate them away in terms of their relative influences (Greenhalgh and Winckler 2001: 67).

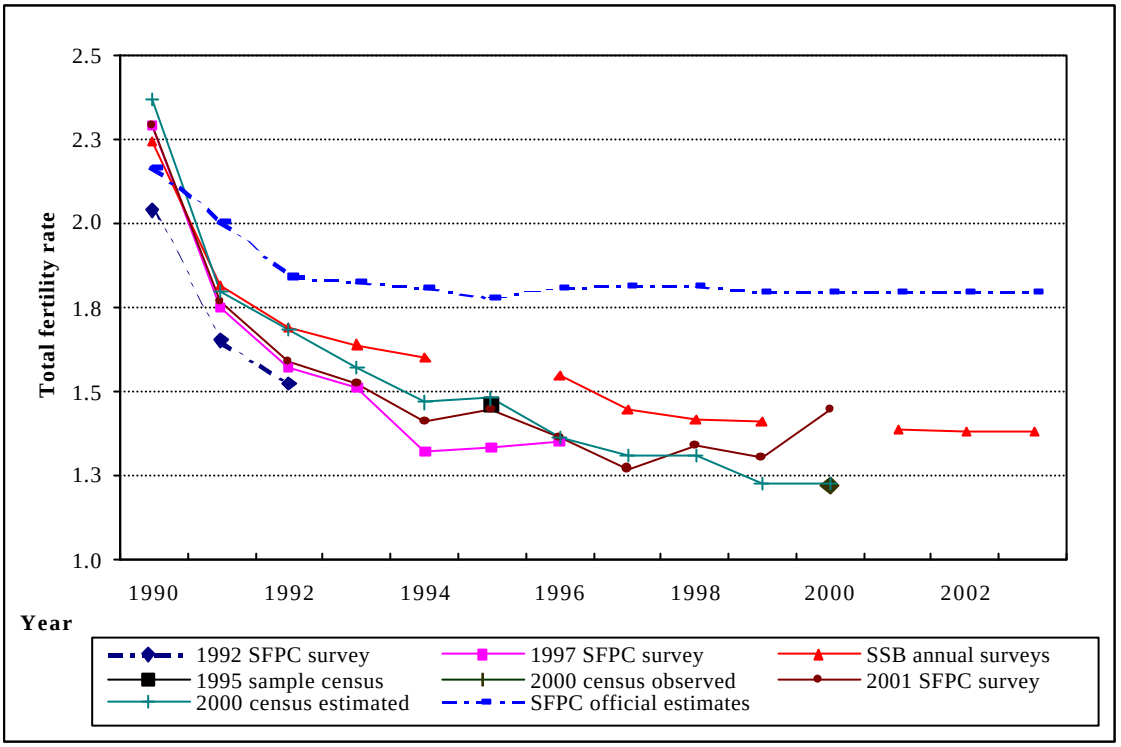
There were no explanations for far-below-replacement level fertility before the 2000 census results being available, because whether China had achieved such fertility was still a controversial topic. The two major determinants, namely the family planning program and socio-economic development, are most likely the driving forces of further decline of fertility in the 1990s. But it is important to review that controversy to discover why people have failed to recognise one of the most important fertility changes in human history.

1.2 Controversy over fertility levels in the 1990s

1.2.1 Consistently observed very low fertility in surveys and census

The total fertility for 1989-90 was 2.24 and 2.30 as observed in the 1990 census and annual survey, respectively (SSB 1991a; SSB 1991b). However, during the following years, a number of surveys gathered by different government agencies consistently reported very low fertility. For example, the total fertility reported in the 1995 one percent sample census was 1.46, while the fertility rates reported from the SSB annual surveys were between 1.55 and 1.41 from 1996 to 1999. Moreover, the 2000 census long form reported a total fertility of 1.22, and the census-estimated retrospective series were also under 1.5 after 1994. Figure 1.2 presents the total fertility rates directly estimated from original data in selected sources of data. For the purpose of comparison, it also includes the published estimate series from the SFPC.

Figure 1.2 Total fertility rates observed in selected surveys and censuses, and the official estimates in China, 1990-2003



Sources: The SSB series of 1991 and 1992 are author's own reconstructions based on the SSB statisticians' reports (Sun and Hu 1992; 1993); after 1993 are from the SSB (SSB 1993-2002) ; the 1992, 1997 and 2001 SFPC survey series are own calculations.

Note: The 1997 and 2001 series of fertility rates are truncated at age of 35 owing to data limitations.

It appears that the directly estimated fertility series from all sources of data except the 1992 SFPC survey were in close agreement in 1991-92. During the following years, the SSB annual survey series reported higher fertility than other sources. But the fertility series estimated from the 2001 SFPC survey and those estimated from the 2000 census also agree with each other from 1990 to 1999 with slight difference each year, except in the census year of 2000 with large variations up to 16 percent. All estimates from different data sources tell the same story: a sudden fertility drop below replacement level in 1991, and then a gradual but constant decline to a very low level between 1.3 and 1.5 from the mid-1990s. If there was no problem of underreporting of births in surveys and census, it could reasonably be claimed that China had already joined the group of countries with very low fertility under 1.5 as early as the mid-1990s.

China's population statistics once had a high reputation for remarkable accuracy and completeness, but it was discovered, primarily after the 1990 census, that all the population statistics suffered from underreporting of births, as a result of the introduction of the one-child family planning program (Hu 1994; Zha, Zeng and Guo 1996; Zhang 1995). Subsequently, demographers and policy makers were increasingly concerned with the quality of fertility data. How to estimate the extent of underreporting of births, or how the 1990s fertility data should be interpreted is a challenging question. This is especially important in China, not only because the family planning program demands highly accurate data for monitoring progress, but also because one minor error in estimated fertility could result in millions of omissions or duplications in a huge population base of more than one billion.

1.2.2 Interpretation of fertility data by demographers and policy makers

All controversies over fertility and concerns on data quality can be traced back to the results from a retrospective fertility survey conducted by the SFPC in 1992 (hereafter the 1992 survey). The total fertility rates for 1991 and 1992 directly calculated from the 1992 survey were 1.65 and 1.52, respectively, a reduction of about 30 percent from the total fertility of 2.30 for 1990. When the survey results were available in early 1993, they immediately provoked much controversy and contentiousness among demographers. The SFPC official statement of achieving replacement-level fertility by the then Minister Peng Peiyun in April 1993 (Peng 1993a) further aggravated this situation, which resulted in international concerns of program coercion (Kristof 1993). Subsequently, the SFPC officials became very cautious in discussing low fertility and often described the fertility as 'at or below replacement level' (Greenhalgh and Winckler 2001: 64).

However, from recently available information, the 1992 survey is neither the first nor the only statistical investigation reporting low fertility rates. The SSB still released the total fertility and age-specific fertility rates estimated from the annual survey in 1990, but did not release these series for 1991-93 as usual in the *China Population Statistics Yearbook* (*zhonguo renkou tongji nianjian*), most likely because of the low fertility rates emerging from the survey results. This was confirmed by a recent effort

to estimate fertility based on the SSB statisticians' papers, of which the results directly calculated from the unadjusted data for 1991-92 were 1.82 and 1.69, respectively (Zhang 2004). Even allowing correction for underreporting, the estimated total fertility of 2.01 and 1.86 still suggested a large-scale reduction from those in 1989-90 (Zhang and Su 1995: 2). Despite the different fertility estimates, both the 1992 survey and annual surveys congruously reported a sudden and extraordinary decrease of fertility between 1989-90 and 1991-92.

The seemingly unbelievable estimates from the 1992 survey were immediately rejected by demographers and were suspected to be the result of serious birth underreporting. But there were different estimates of the extent of this underreporting. From the evaluation of program performance in sampled areas, the SFPC believed that the 1992 survey probably underreported 13 percent of births in 1991-92, and accordingly adjusted the TFRs upwardly to 1.87 and 1.72 (Jiang, Zhang and Chen 1995: 869-870; Jiang et al. 1996: 18). Feeney and Yuan (1994) showed that fertility levels before 1990 estimated from the 1992 survey were consistent with those estimated from earlier SSB and SFPC surveys and the 1990 census, but births after 1990 may be underreported. According to the declining trends of fertility in the 1980s, they speculated that the 1992 survey may have underreported births 'by between 10 and 20 percent' in 1991-92 (Feeney and Yuan 1994: 381). Nonetheless, these lower estimates of the extent of underreporting were not generally accepted by demographers (see Merli 1998). Zeng (1996) made a comparison of births estimated from the 1992 survey with those from the family planning statistics after adjusted for underreporting, and concluded that the 1992 survey could have underreported births between 25 and 28 percent in 1991-92 (Zeng 1996: 34). He further concluded that all population statistics suffered more severe birth underreporting in the early 1990s, because of the recent strong policy enforcement. Nonetheless, despite these different estimations of the exact extent of underreporting, most demographers agreed that the fertility probably fell to replacement level in the early 1990s, while some still insisted that the fertility should be still well above that level (Liang 2000; Ma 2002).

Given the rising suspicion on data quality, the SFPC recruited its own staff to directly conduct surveys in rural villages in Hebei and Hubei province in 1993. These surveys reported that local family planning statistics in these two provinces underreported 35.5 percent births in the year 1992 (Wang and Wang 1995), or 37.3 percent in 1992 and the first nine months of 1993 together (Zeng 1996). This was the first time that there was direct evidence of underreporting of births in statistical investigation. During the following years, the SFPC carried out a series of these surveys in villages in another 9 provinces (hereafter the SFPC village surveys), and obtained first-hand evidence of underreporting in local family planning statistics. But the findings of the first two surveys in Hebei and Hubei have been widely used in analyses in discussing the quality of fertility data.

As the data problems attracted more and more attention, the China Population Association (CPA), in collaboration with the SSB and SFPC, organised a special seminar targeting the data quality in population statistics held at Peking University in April 1995. In this seminar, the SSB statisticians introduced the problems of underreporting of births in the annual survey, and their counter-measures in changing survey procedures and experience of conducting post-enumeration surveys (Jia and Sai 1995). The SFPC officials also introduced the problems in the family planning statistics since the late 1980s (see Zeng 1996). The participants discussed the patterns and causes of underreporting, and concluded that all population statistics had suffered serious underreporting as a result of the program tightening since the early 1990s (Zhang 1995).

Subsequently, very low fertility around 1.3-1.4 was consistently found in a number of surveys in the second half of the 1990s, including the 1995 one percent sample census (hereafter the 1995 sample census), the annual surveys from 1996 to 1999, and the 1997 SFPC retrospective survey (hereafter the 1997 survey). These further reinforced widespread concern about the deterioration in the quality of fertility data. The consistency between different sources of data was interpreted to indicate consistent underreporting of births. Many demographers believed that the population statistics no longer reflected reality because of serious underreporting of births (e.g. Cai and Zhang 2000; Chen 1999; Qiao 1998; Tan 1998). Consequently, most fertility analyses used the official CBR series to estimate fertility and achieved a similar

result: fertility first declined in 1991-92 and then remained roughly constant around 1.8 after 1992 (e.g. Attane 2001; Goodkind 2004; Liu and Lin 2000; Qiao 1998; Yu and Xie 2000; Zhang 1997).

Much hope had been placed on the 2000 census to solve the disagreement on fertility level. However, the census enumerated smaller younger cohorts than those estimated from annual surveys in the respective years, failing to validate the suspicions of birth underreporting. Moreover, the extremely low fertility of 1.22 for 2000 further aggravated controversy. Some demographers considered that it was just another case of more serious underreporting since the early 1990s. Accordingly, they estimated that fertility in 2000 was probably around 1.8, implying a more than 30 percent census under-enumeration of births (CPIRC Research Group 2003; Goodkind 2004; Zhang and Cui 2003). Other demographers started from analyses of data in depth and suggested that fertility levels in the 1990s could be much lower than generally believed, though not as low as observed in surveys and census, and the fertility in 2000 was probably around 1.5-1.6 (Guo 2004; Retherford et al. 2004; Zhang 2004).

Certainly, the rejection of the observed very low fertility by most demographers was not only because of their suspicions of underreporting. It was generally believed that fertility would stall around replacement level in developing countries and any further decline would be very difficult (see United Nations 2001). The fact that fertility fluctuated above replacement level in China over the 1980s was often used to support this argument. Moreover, the low level of socio-economic development was frequently given as evidence of the unlikelihood that very low fertility could have been reached (Zeng 1996; Zhang and Cui 2003). It was universally believed that the Chinese people had high fertility demands, and the low developmental level would not have been sufficient to persuade individual couples to voluntarily control fertility like their counterparts in developed countries, had the official family planning program not been in effect for decades.

1.3 Limitations and problems in data interpretation

There was no agreement on the exact extent of underreporting of births, but most demographers and policy makers tend to believe by the late 1990s that births were routinely underreported by an astonishing 20 to 30 percent (see Greenhalgh 2003; Greenhalgh and Winckler 2001: 61). It was this judgment that persuaded them to accept a moderately low fertility estimate of around 1.8 throughout the 1990s. However, a preliminary analysis reveals many contradictions. For example, except in the family planning statistics (Wang and Wang 1995), no direct and convincing evidence demonstrated the generally suspected substantial underreporting of births. Rather, both the post-enumeration surveys for the SSB and SFPC surveys reported about 6 to 7 percent, no more than 10 percent underreporting (Jia and Sai 1995; Wang 2000b; Wu 2001). As a matter of fact, the family planning statistics differed considerably from surveys and censuses, in terms of data collection operations and problems in underreporting of births. And the serious extent of underreporting in the family planning statistics does not necessarily suggest the same extent of underreporting in surveys and census. But these differences have not been fully appreciated.

Moreover, the reliance upon the SSB official estimates in most analyses indicates endorsement of the SSB evaluation of the completeness of annual surveys. The difference between the observed and adjusted fertility based on the SSB surveys was on average 12.1 percent in the first half of the 1990s, when demographers and government agencies paid much attention and took practical measures to improve data quality, but increased to 16.3 percent on average during the second half of the 1990s (Zhang 2004). This rising gap implied an increasing underreporting of births (see Figure 1.2). However, because a number of data sources were quite consistent in reported fertility, there is a strong reason to question this consistent-underreporting argument, just as Feeney and Yuan argued:

> …in view of the observed consistency of levels and trends from different sources, substantial underreporting of births would imply an implausible degree of consistency of underreporting in the various censuses and surveys…. This is possible, as a matter of pure logic, but, it would strain credulity to believe such consistent underreporting

> would actually occur. It would appear to require that most women in China keep a false set of reproductive books, so to speak, mentally or in writing, and refer to them faithfully and accurately whenever they respond to official questions about their childbearing experience (1994: 392).

Although the program tightening since the early 1990s was primarily blamed for data deterioration (Zeng 1996), one more recent study clearly documented that the program performance was greatly strengthened in every aspect during the 1990s; this could really bring fertility down (Greenhalgh and Winckler 2001). In this case, a balanced perspective is required to examine the programmatic effects both on fertility reduction and on data quality. Equally important is the consideration of effects from the rapid socio-economic development that occurred in the 1990s.

Along with the programmatic and societal changes, the 1990s saw changes in reproductive behaviour, such as the postponement of marriage and childbearing, reversing the trend in the preceding decade. Some authors employed alternative fertility measures such as the TFR based on parity progression ratios, or the tempo-adjusted TFR, to illustrate the distortion effects of delayed marriage and childbearing on the conventional fertility measurement (Ding 2003; Feeney and Yuan 1994; Guo 2000c; Guo 2004). Their findings challenged the immediate rejection of observed fertility figures in surveys or census only because they appeared too low, given that the conventional period total fertility rate is subject to tempo effects of changing marriage and childbearing pattern.

Last but not least, although the argument that fertility decline in developing countries would probably stall at replacement level seemed persuasive in the early 1990s, it failed to pass the test of time in both developed and developing countries (United Nations 2003). Some developing countries with moderate developmental levels and effective family planing programs, such as Thailand, also experienced a quick fertility decline to below replacement level. Given the rapid development and the strength of the family planning program in the 1990s, there is no reason to question the rapidity or depth of fertility decline in China.

Looking backward, perhaps too much attention has been paid to data quality, while the effects of the programmatic and societal changes on fertility were greatly ignored. A careful and comprehensive analysis of the data sources and the effects from programmatic and societal changes becomes indispensable for any fertility analysis to be believable.

1.4 Research objectives, questions, and scope

This thesis aims to address the question of how fast and how far China's fertility fell in the 1990s. To this end, this research not only looks into data collection operations and data-specific problems in population statistics, but also examines the effects of the family planning program and socio-economic development on changes of fertility preferences and behaviour. On the basis of the above reviews and preliminary analyses, the following sub-objectives of this research are proposed:

1. To identify the differing causes and patterns of underreporting of births and to reasonably estimate the extent of underreporting in each data source.

2. To re-estimate the levels and trends of fertility in China throughout the 1990s;

3. To examine corroborating evidence and underlying causes for fertility decline in the 1990s.

To achieve the above objectives, the following research questions are answered:

1. Did all fertility data suffer from underreporting of births to the same extent? If not, what were the patterns and causes of underreporting of births in each data source? Did the quality of fertility data deteriorate more seriously in the 1990s than in the 1980s?

2. What were the most likely estimations of the extent of underreporting in surveys and census in the 1990s? Under the current circumstances, what was the most likely estimation of fertility levels over the course of the 1990s?

3. Should the programmatic changes since the early 1990s only be blamed for data deterioration? What were the effects in fertility reduction from the rapid socio-economic development? Did the gap between state policy and popular fertility demands become narrower? What were the contributions of some major proximate determinants, such as marriage and contraception?

This research carries out all analysis at the national aggregate level. It would be better to further analyse the differentials at the rural-urban or provincial levels, but restrictions on data availability limit this attempt. It is still very difficult to obtain some relevant sources even at the national level. Meanwhile, given the confusion in interpretation of fertility data and the uncertainties of fertility levels, the focus on clarification of data and fertility change at the national level undoubtedly provides a solid basis for more thorough and in-depth study in the future.

1.5 Sources and availability of fertility data in population statistics

A variety of data sources have been available for fertility analysis since the early 1980s, including (1) the *hukou* statistics based on the household registration (*hukou*) system; (2) the family planning statistics, or the program statistics; (3) the annual survey for population change, including the intercensal sample census; (4) the respective demographic and reproductive health survey; and (5) the decennial population census. These population statistics, under the administration of three government agencies serving differing purposes, are gathered using different approaches through their respective administrative channels.

The *hukou* statistics administered by the Ministry of Public Security (MPS) are derived from *hukou* registrations, which are kept at police stations at the basic level.

Although the information in the registrations heavily relies on each household' own reports, the statistics are aggregated by police officers and upwardly reported within the system. The importance of these statistics, the only available yearly official demographic source before 1982, has greatly diminished in recent decades, partly because of the emergence of other population statistics, and partly because of the weakened reliability of the *hukou* system as population mobility has increased. Although no demographers have used these statistics in demographic analysis, they still play a fundamental role for other statistics; but this important role has not been widely recognised, except in the census. From 1986, the MPS published the national and provincial aggregate statistics each year in the *National Population Statistics by City and County (quanguo fen xianshi renkou tongji ziliao).*

The family planning statistics from the SFPC are used to monitor and evaluate program performance from the higher to lower levels. They are compiled and upwardly reported by local program workers, rather than individual couples, from registrations kept at family planning institutions at the basic level. They are not suitable for fertility analysis because of their low quality, but have been frequently referred to in fertility analysis, because the SFPC series of village surveys provided first-hand evidence of the underreporting of births. However, the inadequate understanding of these statistics often caused confusion in the practice of fertility estimation using other sources. Each year, the SFPC published the *China Family Planning Yearbook (zhongguo jihua shengyu nianjian)* containing national aggregate statistics of marriage and contraception, but unfortunately, the records of births were intentionally omitted from 1991 to 1998, most probably because of the huge shortage in the number of recorded births.

In addition to gathering the routine statistics, every four or five years the SFPC organises a retrospective survey for which data are gathered at the grassroots level by trained interviewers. Up to date, five surveys have been conducted: the 1982 One-per-thousand Fertility Survey (hereafter the 1988 one-per-thousand survey), the 1988 National Fertility and Contraception Survey (hereafter the 1988 two-per-thousand survey), the 1992 National Fertility Survey (the 1992 survey), the 1997 Demographic and Reproductive Health Survey (the 1997 survey), and the 2001 Family Planning and Reproductive Health Survey (the 2001 survey). As they are a rich source of

information on marriage, fertility and contraception, these surveys have been widely used by demographers to estimate fertility retrospectively. After each survey, the SFPC organised a national or international conference to invite demographers to analyse the survey data in depth, and then published the conference papers. The computer record data are available for academic research. Because of their usefulness in covering the whole decade, the 2001 survey data are employed in in-depth analysis in later chapters of this thesis.

The SSB is the state agency responsible for economic and demographic statistics, which in collaboration with its provincial branches organise the population census and sample surveys during the intercensal period. The population census has been widely used because of its comprehensiveness and completeness. After each census, besides the published detailed tabulations, the SSB also releases the micro-sample census data to selected research institutions. The annual surveys, including the intercensal sample census, are the basis for the yearly official statistics. The SSB does not release the original unit record data of annual surveys for academic research, but it released the tabulations of unadjusted surveys at the national level in the *China Population Statistics Yearbook* in most years during the 1990s. This thesis uses these secondary data in fertility estimation.

In general, despite the richness of data sources, the limited availability of detailed information largely restricts further analysis. It is fair to claim that the controversy over fertility in the 1990s was closely associated with the data limitation. However, a detailed analysis of the available data from each source and its specific problems is still most helpful in understanding the common data problems.

1.6 Structure of the thesis

This thesis aims to re-estimate the levels of fertility in the 1990s, but the nature of the long-lasting controversy determines the most effort in this thesis being put on the evaluation of data quality and estimation of the extent of underreporting. In addition, these estimations need to be made in a broader context of programmatic and socio-economic settings. On the basis of these detailed analyses, the thesis reconstructs the

time series of fertility levels in the 1990s. Then it goes further to examine some corroborating evidence in both attitudes and behaviours. Therefore, the thesis is arranged as follows:

Chapter 2 explores the potential programmatic effects on fertility data. After reviewing the previous research on birth underreporting and their drawbacks, it describes the 1991 Decision and the subsequent program strengthening. Then it examines the potential effects of the family planning policy and the program implementation on birth reporting from both individuals and data collectors. It also analyses the different perspectives of different government agencies, and their underlying causes.

The thesis from Chapter 3 to Chapter 5 studies the data–specific problems of underreporting of births, the underlying institutional constraints and the outside influences in each data source. Chapter 3 focuses on two sets of population statistics serving administrative purposes: the *hukou* statistics and the family planning statistics. The fundamental role of the *hukou* statistics affecting other statistics is highlighted, and the misunderstanding of data sources arising from the family planning statistics is also identified and clarified. Chapter 4 focuses on underreporting of births and young children in population censuses. While analysing underreporting problems in the 1982, 1990 and 2000 censuses, Chapter 4 devotes considerable space to analysing the negative effects of the hugely increased population mobility on the completeness of the 2000 census. Chapter 5 introduces the SSB annual surveys and the SFPC retrospective surveys, and explains why sample surveys have a far more complete reporting of births than other sources. It also makes a comparison to illustrate the different patterns in underreporting of births between the annual surveys from 1991 to 2000 and the 2001 survey.

Chapter 6 reconstructs the path to far-below-replacement level fertility in the 1990s and then examines this fertility decline from the perspective of international comparison. It first assesses the roles of different sources of data in fertility estimation and chooses the SSB annual surveys as the basic data source. It then gauges the extent of birth underreporting in the SSB surveys and further estimates

the age-specific fertility rates and annual births. It also makes a comparison of experience in fertility decline between China and other Asian countries.

Chapter 7 and Chapter 8 present the relevant evidence for the rapidity of fertility transition in China. Chapter 7 examines the changes in attitudes towards childbearing during the past three decades; drawing on the SFPC surveys, multivariate analysis techniques are applied to model the effects of fertility preferences on actual fertility. Chapter 8 moves closer to the proximate determinants of fertility, of which the effects of delayed marriage and universal contraception are singled out for examination. The Bongaarts model is also applied to illustrate the relative importance in fertility-inhibiting effects of the major proximate determinants.

Chapter 9 summarises the major findings in this research and focuses on addressing the questions about underreporting of births arising from common perspectives in the 1990s. In addition, it also points out the limitations in this research and the direction for future research.

Chapter 2 Program Strengthening in the 1990s and Potential Effects of Program on Underreporting of Births

In the Chinese context, the family planning program not only greatly contributes to rapid fertility reduction, but also has adverse effects on demographic measurement, in particular birth reporting. Nonetheless, most demographers believed that the 1991 Decision and the following program strengthening were responsible for the data deterioration in the 1990s (see Chen 1999; Qiao 1998; Tan 1998; Yu and Xie 2000; Zeng 1996), while these demographers overlooked the fact that improvement of program efforts would be conducive to bringing fertility down. This resulted in incomplete and misleading understanding of the programmatic changes and hence their effects on both fertility and data collections.

Both the family planning policy and the procedures of policy implementation affect the quality of fertility data. In general, the chances of underreporting births are much higher than of overreporting births. The gap between state policy and popular fertility aspirations, and the program penalties for those couples who have more than the permitted number of children, the out-of-plan births, provide many couples with disincentives to accurate reports of fertility behaviour, if they do have out-of-plan births (Banister 1987; Smith et al. 1997). Moreover, since the policy touches each individual couple through the family planning network, the procedures of program implementation, such as the target assignment process or fines imposed on out-of-plan births, may offer further disincentives to individual couples, program workers and other data collectors.

However, great caution is required in interpreting these effects on underreporting of births, because they are sufficient but not necessary. Whether individual couples underreported out-of-plan births has largely been dependent on the strength of program efforts in different areas. More importantly, the completeness of each set of population statistics has been largely associated with factors relevant to data collection, such as who collects the data or how data are collected. This chapter mainly examines the potential effects of the family planning program on fertility

data, while the following analyses from Chapter 3 to Chapter 5 discuss the data-specific problems in each data source. Before examining the programmatic effects, this chapter reviews the post-1991 program strengthening and its effects on fertility decline. Section 2.1 reviews the previous research on birth reporting and identifies its limitations. Section 2.2 introduces the 1991 Decision and the following strengthening of program efforts during the 1990s. Section 2.3 examines the potential effects of family planning policy on individual birth reporting, and section 2.4 explores the potential effects of procedures of program implementation on birth reporting. Section 2.5 looks at the different positions and institutional constraints of government agencies on collecting fertility data. Section 2.6 is the chapter conclusion.

2.1 Previous research and limitations on underreporting of births

Until the late 1980s the Chinese population statistics still took pride in the good quality of the 1982 population census and one-per-thousand survey. Nonetheless, there was cumulative evidence on underreporting of births in the family planning statistics (*People's Daily* 1988; Su 1989; Xie 1990) and the *hukou* statistics (MPS & SFPC 1988). In addition, the observed abnormal sex ratio at birth in large-scale surveys, such as the 1987 sample census (Hull 1990) and the 1988 two-per-thousand survey (Johansson, Zhao and Nygren 1991), caused some authors to suspect that they may have underreported female births. Understandably, the seriousness of underreporting was not fully appreciated until the early 1990s when the 1990 census results became available.

2.1.1 Previous research on patterns and causes of underreporting

The 1990 census not only revealed underreporting of births in all statistical investigations in the 1980s, but further facilitated research about the patterns and causes of birth underreporting during the 1990s. A quick review of three main population journals in China, the *Chinese Journal of Population Science*, *Population Research* and *Population and Economy*, finds at least 10 papers exploring this topic specifically. The deterioration of fertility data also attracted interest from the

international demographic community (e.g. Attane and Sun 1999; Merli and Raftery 2000; Smith et al. 1997).

Most of these studies discussed the problems in the family planning statistics, while some examined problems in surveys and censuses. According to these studies, the major patterns of underreporting of births in population statistics can be summarised as follows: (1) most underreporting of births occurred in rural areas; (2) births with certain characteristics were most likely to be unreported, such as births to women under the legal minimum age at marriage, female births from daughter-only households (*du nu hu*), and second and higher-order out-of-plan births; (3) out-of-plan births which occurred close to the time of investigations were more likely to be unreported; and (4) previously unreported births in surveys and censuses would show up as young children in later ones (Guo 2000b; Hu 1994; Shao and Li 1993; Sun and Qing 1993; Tu and Liang 1994; Zeng 1995; Zha, Zeng and Guo 1996).

Many studies attributed the causes for underreporting of births to the family planning policy. On the one hand, the policy imposed restrictions on the number of children that each couple was allowed to bear, only one for urbanites, and at most two for peasants; on the other hand, most Chinese people, especially peasants, wanted to have more than the permitted number of children, or at least one son. To escape penalties, both local program workers and individual couples who had out-of-plan births would choose not to report of fertility behaviour accurately, as Merli and Raftery argued:

> In a context in which the number of children is determined by state policy and the desire for a son is strong, neither individuals nor birth planning cadres have great incentives to report births followed by infant deaths, births not approved by the birth planning system, or female births (2000: 109).

However, this explanation did not satisfactorily answer the question why fertility data deteriorated more seriously in the 1990s, since the one-child policy had already been in effect for a decade. Therefore, many authors suggested that the program strengthening in the early 1990s should be blamed. They especially identified the introduction of the so-called 'one-veto-down' system (*yipiao foujue*) in evaluating

the performance of sub-national leaders in 1991, which stipulated that failure in family planning could wipe out performance in all other aspects. They argued that the increasing pressure offered local cadres and individual couples greater incentives for not reporting fertility behaviour accurately, which even went into collusion, because local cadres worried about the program evaluation based on the collected statistics, while couples who had out-of-plan births wanted to escape penalties (Zeng 1996). This perspective became significant at the CPA seminar targeting data quality of population statistics in 1995 (Zhang 1995), and has been widely accepted in the following years (Attane 2001; Goodkind 2004; Tan 1998; Yu and Xie 2000; Zhang 1997; Zhang and Cui 2003).

2.1.2 Limitations and problems in previous research

While previous research enriched the general understanding of the deterioration in data quality, there are also many limitations and problems in identifying the causes of underreporting in the 1990s. First, when many authors concluded that all population statistics had suffered from more serious underreporting of births since the early 1990s, they neglected the differences in the completeness of birth records between different data sources (e.g. Goodkind 2004; Merli and Raftery 2000; Tan 1998). These differences were nothing new even in the 1980s. It was found, for example, that 'in the 1980s and 1990, the surveys and censuses have consistently demonstrated far more complete birth reporting and far more complete counts of young children than the registration system' (Banister 1994: 257). During the 1990s, these kinds of differences continued. For example, in the widely cited paper of Zeng (1996: 32), he listed the huge difference between births recorded in the family planning statistics and those estimated from the 1992 survey in 1991-92, which unfortunately did not attract much attention. A more recent study shows the hugely different number of births between those recorded in the family planning statistics and *hukou* statistics and those estimated from annual surveys during the past two decades (Scharping 2003: 250).

Second, given the vast discrepancies across data sources, one would have to suggest factors affecting data quality other than the family planning program. Many authors

too simply attributed underreporting of births to the family planning program, especially the program strengthening since the early 1990s. As mentioned in Chapter 1, this was not a complete understanding because of its neglect of the effects the program strengthening in the 1990s on fertility reduction. Moreover, if the program strengthening were the only cause for underreporting, logically all statistics should have reported the same fertility figures at the same time. The reason for ensuing this agreement between all sources is very simple but reasonable. Because of the availability of several sources of statistics, the higher-level family planning administrations certainly could have used other sources to evaluate program performance at the lower levels if they did not trust one set of statistics. This was the practise of the SFPC in the 1990s, which shifted to the SSB annual surveys to evaluate the program performance. Thus, if there were systematic engineering by local cadres and individual couples, they must have considered every possibility and taken everything into account. However, this was not the case (Zhang and Yuan 2004). Obviously, ignorance of the difference between each data source resulted in incomplete understanding of causes for underreporting of births.

Third, it has not been recognised that the difference between data-gathering agencies, and the different degrees of involvement of program workers and individual couples in statistical investigations, can make a difference in data quality. For example, whether the data-gathering agency is the family planning administrations or other agencies, or whether local program workers are involved in data collection, or whether information is gathered directly from individual respondents, or whether interviewers are experienced statisticians or adequately trained, could all affect the completeness of births in each investigation. Many studies claimed that both local program workers and individual couples contributed to underreporting of births (see Attane 2001; Merli and Raftery 2000; Tan 1998). However, for the data gathered by other than the family planning administrations, the data collectors are not program workers and may have different considerations. In addition, even if both local program workers and individual couples are involved, there have different considerations: the former are concerned with whether they can meet the pre-assigned family planning targets and will resort to data manipulation if necessary, while the latter care more about whether they can achieve their fertility goals both in family size and in sex composition. As mentioned earlier, only local program

workers are involved in the family planning statistics, but individual couples are the primary information providers in surveys and censuses.

In general, it is mistaken to conclude that births would be equally underreported in different data sources, and it is too simple to attribute underreporting to the effects of the family planning program. In addition, there was a lack of complete and correct understanding of the 1991 Decision and the following strengthening of program efforts. Moreover, It is very important to recognise that who collects the fertility data or how the data are collected also strongly affect the quality of each data source.

2.2 Strengthening of program efforts after 1991

2.2.1 The 1991 Decision and the subsequent strengthening of program efforts

Despite the strenuous efforts in family planning in the 1980s, the 1990 census results were astonishing for policy makers. The total population increased from 100.4 million in 1982 to 113.1 million in 1990 as enumerated in the 1982 and 1990 censuses (Yao and Yin 1994). The average net increase rate was 14.74 per thousand each year, equal to an annual increase of 16.25 million. This suggested that not only the moderated target to limiting the population to around 1.25 billion in 2000 was impossible to achieve, but also the total population would exceed 1.3 billion had the same pace of population growth in the 1980s been maintained. Furthermore, the 1990 census revealed the widespread underreporting of births in all population statistics. The policy makers had every reason to seriously worry about losing control of population growth, if no steadfast measures were taken to ensure policy enforcement. All these considerations were embodied in the 1991 Decision, which set the tone for both family planning policy and program implementation in the 1990s (CPC Central Committee and State Council 1991).

Among all the measures taken, the most important part of the 1991 Decision was its requirement of political commitment from all party and government leaders. Since

the late 1970s when China began the reform and open-up policy, economic development has been put at the top of the agenda of governments at each level. Achievements in economic development determined the promotion and prospects of all sub-national political leaders. The family planning program, though stated as one of the nation's priorities in the Constitution, was often put aside, owing partly to its difficulty in implementation, and partly to its lack of immediate economic gains. Meanwhile, as only one among many government departments, neither the SFPC nor provincial family planning commissions could effectively co-ordinate other government departments at the same administrative level, or local governments at lower levels, to ensure the implementation of program. Now, this situation was completely changed, as the 1991 Decision clearly required that

> Party committees and governments at each administrative level must put family planning on the same level as economic development in their primary agenda, incorporating family planning into the local economic and social development plan. The party secretary and government head, the sub-national political leaders, must be in charge of the family planning work and take full responsibility (CPC Central Committee and State Council 1991)

Unlike any other previous directives, the 1991 Decision extended the responsibility for family planning from the family planning institutions to local governments, from program leaders to all sub-national political leaders (Winckler 1999). Moreover, the governments at each level greatly increased the weight of family planning in the performance evaluation of governments at lower levels, and stipulated that failure to complete the family planning target would cancel out achievement for governments and their leaders in all other aspects. This forced all governments and their leaders to take the family planning program seriously. In China, this political commitment is extremely important to guarantee all the necessary supports, from personnel and funding to technical training and service.

It was concluded that the shortage of funding was one important cause of the weak program performance in the 1980s (Peng 1991a). During the 1990s, both government financial investment in family planning and funding from other sources increased considerably. The State Council required governments at each level to ensure a funding increase on average from one yuan per capita in 1991 to two yuan per capita

in RMB during the period from 1991 to 1995. In fact, the financial investment increased from 140.6 million in 1991 to 338 million in 1995, well meeting the target with 2.68 yuan per capita in 1995, 34 percent higher than the target. Then in 1996, the State Council further required governments at each level to increase the funding to four yuan per capita. Again, this target was achieved one year in advance (Cai and Du 2001). In addition, the funding from other sources, primarily the collective levies in rural areas and fines for out-of-plan births, increased greatly from 260 million in 1990 to 602 million in 1995 and further to 712 million RMB yuan in 1998, respectively (Sheng and Qi 2000).

At the same time, the administrative institutions and personnel engaged in family planning at the grassroots level were again strengthened. In the early 1980s the rural economic reform greatly weakened state control over the peasants, let alone the family planning institutions (White 1991). But in the 1990s, the family planning offices had been established inside the township governments with specific personnel for different duties. In fact, some field studies documented that these important changes had occurred since the late 1980s in Jiangsu and Shannxi province (Greenhalgh 1994; Thomas and Price 1996). By the year 2000, there were 400, 000 family planning workers, of whom 120, 000 engaged in contraceptive services at the county and township level. Village cadres were also specifically and clearly assigned duties. The increase in personnel included not only program workers but also the volunteers from the Family Planning Associations (FPAs) across the country (Greenhalgh and Winckler 2001; Thomas and Price 1996).

In the 1990s, the SFPC and provincial governments put great effort into creating a nationwide family planning service network. It was reported that up to 2000, 90 percent of all counties and 80 percent of all townships had established family planning service stations; and 70 percent of family planning operations were conducted at the county and township level (Government of PR China 2002). While administrative capabilities at the basic level were increased, the penalties, fines for out-of-plan births, imposed on individual couples also increased. All provincial regulations stipulated the fines for couples who violated the family planning policy; the fines for having higher-order unauthorised births were be much higher than those having early births or having unauthorised first-order births. During the 1990s, the

average fine for having an out-of-plan birth was about 2-3 times a couple's previous annual income (see Greenhalgh 2003; Scharping 2003).

One of the most important program inputs were the increase in the contraceptive prevalence rate (CPR) (discussed in detail in Chapter 8), and the family planning operations, namely the abortion, IUD insertions and sterilisations. Table 2.1 presents the number of cases of family planning operations from 1988 to 2000. There was a sharp increase in the number of all operations between 1990 and 1991, which greatly contributed to the sudden fertility drop at the same time. Nonetheless, there was also a clear trend of reduction in the cases of family planning operations over the decade, more quickly in sterilisations and abortions than IUD insertions. The main reason lies in the increase of contraceptive choices and improvement in contraceptive effectiveness (UNESCAP 2003: 4). It was also associated to the change towards an older age structure of women of reproductive age (see Appendix 1).

Table 2.1 The number of family planning operations in China, 1988-2000

Year	Abortion (millions)	IUD insertion (millions)	Sterilization (millions)
1988	12.68	n. a	n. a.
1989	10.38	15.52	8.71
1990	13.49	15.88	10.02
1991	14.09	16.82	12.52
1992	10.42	14.63	8.29
1993	9.50	13.46	6.14
1994	9.47	13.21	5.53
1995	7.48	13.03	4.88
1996	8.83	12.88	4.64
1997	6.59	12.11	4.01
1998	7.38	11.39	3.63
1999	6.76	10.74	3.53
2000	6.66	9.98	3.04

Sources: The abortion series are from the *China Health Statistics Yearb*ook (MOH 2002: 495); IUD and sterilization series are from the *China Family Planning Yearbook* (SFPC 1989-2001).
Note: The abortion figures in 1992, 1993, 1995 and 1997 did not cover the whole country.

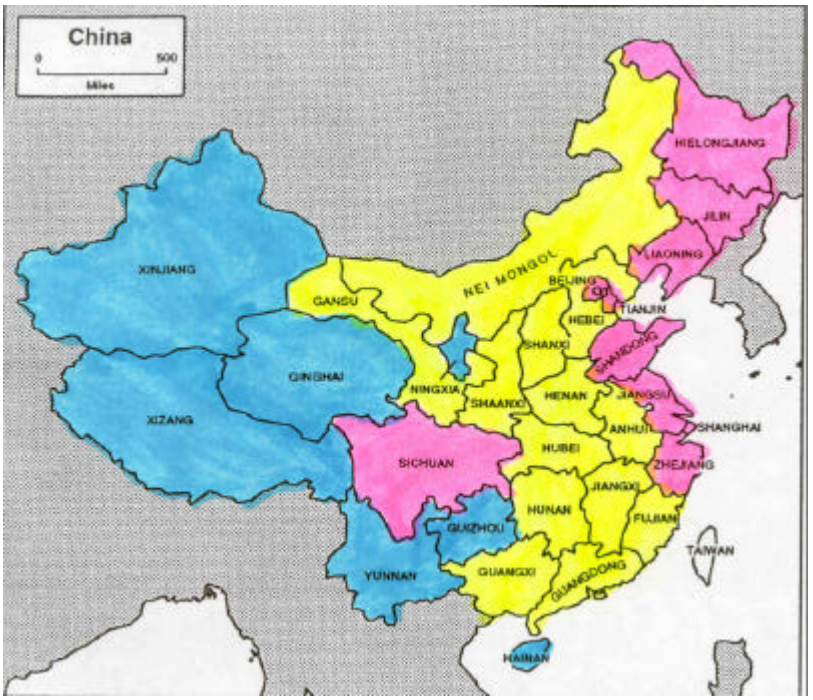
However, contrary to the general perception that the 1991 Decision tightened the program targets, the Chinese government further moderated the target to limit

population to 1.3 billion in 2000. This was actually a big concession from the initial target to limit population to 1.2 billion as proposed in 1979, and also from the moderated target to limit population to 1.25 billion determined in the mid-1980s. It is estimated that the total fertility should be reduced to 2.1 in 1995 and to 2.0 in 2000 to achieve this goal (Gu 1994). Compared to the total fertility of 2.30 for 1990, these aims appeared not to be very difficult. The 1991 Decision clearly stated that not only should population growth be strictly controlled, but also the family planning work should be performed well. This principle was embodied in the later speeches of the SFPC leading group (see Peng 1992; Peng 1993a). Obviously, it was not the intention of the program strengthening to reduce fertility as low as possible.

2.2.2 The SFPC classification of three-category regions in the early 1990s

In the early 1990s, the SFPC fully appreciated the regional differences in program efforts and the imbalance of fertility decline, and decided to devise region-specific guidance responding to local conditions. Consequently, it grouped all the 30 provinces into three categories of regions (*sanlei diqu*) with similar program performance and development level: (1) 'advanced' areas, including 10 municipalities and provinces: namely Beijing, Shanghai, Tianjin, Liaoning, Jilin, Helongjiang, Shandong, Jiangsu, Zhejiang and Sichuan provinces, most of which were coastal developed provinces; (2) 'middling' areas, including 13 provinces: namely, Henan, Hebei, Shanxi, Shaanxi, Inner Mongolia, Anhui, Jiangxi, Hunan, Hubei, Guangdong, Guangxi, Fujian, and Gansu provinces, which were in geographic location, program performance and socio-economic development; and (3) 'backward' areas, the remaining seven provinces in western ethnic minority provinces (Jiang 1993; Peng 1993a). This classification was mainly determined by the provincial program performance, rather than the developmental level. For example, Guangdong province was included in the middling region due to its poor family planning performance, although it enjoyed rapid socio-economic development. On the other hand, Sichuan was considered 'advanced' in family planning program despite its location in the hinterland and lower level of development. The geographic distribution of the three-category regions is shown in Figure 2.1.

Figure 2.1 The SFPC-classified three-category regions in the early 1990s



Source: The groupings of provinces are from the SFPC leaders speech (Jiang 1993; Peng 1993a).

The SFPC realised that there was little room left to further reduce fertility in the advanced areas, which had already achieved below-replacement fertility for a decade (Gu 1987; Tu 2000). Meanwhile, although most provinces in backward areas still had higher fertility between 2.0 and 3.0, their small proportion of the national total meant there was not much cause for worry. It was the middling provinces, most of which were populous agricultural provinces with weak program performance in the 1980s, which greatly concerned the policy makers. The SFPC Ministers visited these provinces more frequently than the developed provinces and lobbied them to invest in the program. More importantly, the party secretaries or governors of most middling provinces were required to introduce their experiences in family planning in the central forum during the period from 1991 to 2000, at which all top leaders and provincial leaders appeared (SFPC 1991-2002). Consequently, these provincial authorities and their subordinates faced increasingly stronger pressure and had to take effective measures to improve the program performance.

In general, the 1991 Decision provided strong political support and resources mobilisation for the family planning program over the course of the 1990s. The

weaknesses in program performance in the 1980s were reversed almost completely in most provinces. These transformations greatly helped to bring fertility down to the level that the family planning program expected in most areas, even though the increasing pressure could result in more underreporting of births in some backward areas in program performance.

2.3 Potential effects of family planning policy on underreporting of births

During the 1990s, the policy restrictions regarding the number and spacing of children were mainly embodied in provincial regulations. Despite some regional differences on permission for couples to have a second child and hence birth spacing, the requirements on timing of marriage and childbearing were quite similar. According to these provincial regulations, the marriages are classified as 'early' marriage (*zaohun*) or 'late' marriage (*wanhun*), and more importantly, the births are divided into 'in-plan' births (*jihua nei shengyu*) and 'out-of-plan' births (*jihua wai shengyu*), depending on whether they met official criteria, or whether they were 'authorised'. Even though everyone is entitled to be married and have the first child, the births not meeting official criteria in timing, or even meeting the requirements but not authorised by local family planning administrations, will still be classified as violations to the family planning program. In most cases, fertility behaviour violating the policy is more likely to be underreported.

The requirement in marriage, similar in most provinces, is one factor causing misreporting of certain marriage and childbearing behaviour. The minimum legal age for marriage is set as 22 for males and 20 for females, as stipulated in the 1980 Marriage Law. Any party or both parties married before the legal marriage age is defined as early marriage, and any birth to women aged under 21 is defined as 'early' childbearing (*zaoyu*). Since the family planning program encourages late marriage and late childbearing, most provinces define any marriage delayed for three years after the minimum legal age as late marriage, i.e. 25 for males and 23 for females. Any birth to women aged above 24 is late childbearing. Most provincial regulations

stipulate conditions of rewards for late marriage and late childbearing, and penalties, mainly fines, for early marriage and early childbearing.

Early marriage and childbearing was long a tradition in rural China, and was still common in the 1980s as revealed in the 1990 census. For example, 10 percent of the total fertility in 1989 was from women aged 15-19, who were certainly married and had children below the minimum legal age (Gu 1992). This figure was much higher than that recorded in the family planning statistics, indicating that the latter had underreporting or misreported data in marriage statistics. As the 1990 census also had underreporting problems, it was expected that the actual proportion of early marriage and early childbearing would be higher.

The timing requirement for childbearing is equally important with the parity requirement in the family planning program. Before the late 1990s, most provinces still required married couples to obtain permission before having births. Accordingly, any first births without permission were considered out-of-plan births in terms of timing, though in essence these births were entitled in terms of parity. Couples failing to meet this requirement would be fined a certain amount of money. The planned birth rate, indicating the proportion of couples having births with permission, was a very important indicator of program evaluation. Therefore, local program workers responsible for family planning often underreported these births or misreported the age of mothers in the family planning statistics. Many couples may also do likewise to escape penalties.

The situation is more complicated for second-order birth because of regional differences in permission for rural couples to have a second child. During the 1990s, some areas still strictly implemented the one-child policy, including the three metropolitan areas of Beijing, Tianjin and Shanghai, the two densely populous provinces of Jiangsu and Sichuan, and urban areas in all other provinces except Tibet. In these areas, any second-order or higher-order births, except those with special difficulties and being authorised, were classified as out-of-plan births. Naturally, they were the targets of the family planning program, and hence were more likely to go unreported. In addition, the higher the birth order, the more likely for births to be unreported.

There were three criteria for provinces which permitted rural couples to have second births: (1) couples could have two children with spacing in Guangdong (before 1997), Hainan, Yunnan, and parts of Hebei and Hunan; (2) couples could have second children if the first is a girl in 18 provinces; and (3) ethnic groups, except Man and Zhuang minority with population more than one million, could normally have two children and could have three if living in remote minority areas. In these provinces, the requirement of birth spacing became very important, and normally the birth spacing is set as four or four-and-a-half years, or women must have reached the age of 28. As a result, even if rural couples had been entitled to have second births, if they had the births earlier than the policy-required timing, or women did not reach age 28, their second births would be classified as out-of-plan births. Several fertility surveys indicated that a large number of rural couples failed to meet the birth spacing requirement in the 1990s (see Ding 2003; Guo 2000a). Because these births would affect the planned birth rate in the current year, they were very likely to be unreported or misreported in the family planning statistics. They were also likely to be underreported in surveys and censuses, but to a lesser extent, as rural couples would consider these births essentially as their entitlement.

The timing requirement of births indeed made population statistics more complicated. For example, the 1992 survey asked all married women about the last four births in detail in terms of both parity and timing. One question listed eight choices for each birth, such as in-plan first-order birth or out-of-plan first-order birth, in-plan second-order birth or out-of-plan second-order birth, and so on (Jiang, Zhang and Chen 1995). This was criticised by demographers who concluded that the wording of such a sensitive question was one important cause of serious underreporting in the 1992 survey (Zeng 1996).

Except for people of ethnic groups living in remote minority areas, very few couples in other areas were entitled to have third or higher order births. The 1991 Decision and provincial regulations emphasised that any higher-order unauthorised births should be ‘absolutely’ excluded (CPC Central Committee and State Council 1991). In addition, provincial regulations prescribed heavy penalties, primarily heavy fines, on higher-order unauthorised births. Despite this, there were still a number of rural

couples managing to have many births. Generally, there were two typical situations. One involved couples who had two daughters but desperately wanted to have one son. These couples were very likely to continue the try until they had the desired son, and underreported their higher-order births. In this case, female births were more likely to be underreported. Second, some couples who already had one son and were not entitled to have any further births, but still wanted to have one daughter. In fact, both field work and nationwide surveys found that most couples still preferred two children, one of each sex (Greenhalgh 1993; SFPC 2000b). They would stop with one desired daughter, or try until they had one daughter. In any case, these out-of-plan births were highly likely to be underreported at the current status investigations, and may show up in later enumerations, or when they were old enough to enter primary school.

It is important to note that not all out-of-plan births would be underreported. In some cases, individual couples may have intentionally misreported second or higher-order out-of-plan births as first or second in-plan births. This behaviour had different effects in different statistics. For example, in registrations, it did not affect the statistics of child numbers in the current year, only the information on birth order, but it would affect the records of previous years. Similarly, in annual surveys, this would result in more complete birth reporting but in wrong birth orders, implying underreporting of births in surveys in previous years. However, in retrospective surveys, the misreporting of birth order resulted in the loss of births from birth histories and in turn affected the retrospective calculations of fertility, because the survey only included one group of women aged 15-49 at the survey time.

During the past two decades, local governments have often added 'local policy' (*tu zhengce)* to policies and regulations from the central and provincial levels, under the rubric of 'in light of local conditions'. In essence, the central governments did not permit the making of such local policies, but it was a typical phenomenon during the reform process of decentralisation. This was the case in the family planning program. For example, in certain provinces the family planning commissions, as well as other government administrations, at the county and township levels often prescribed that out-of-plan births could not obtain certificates of birth, and hence could not register in the *hukou* registration system. In October 1988, the State Family Planning

Commission and the Ministry of Public Security jointly issued a circular to rescind the local policy preventing out-of-plan births from obtaining *hukou* registration (MPS & SFPC 1988). Certainly, the central policy did not always work at local levels, so these local policies also resulted in many out-of-plan births going unreported.

In general, given the gap between the family planning policy and individual fertility demands, and the programmatic penalties for couples who violated the policy, many individual couples and local program workers may choose not to accurately report fertility behaviour to escape penalties. Moreover, the timing requirement, in addition to the parity requirement in the family planning policy, further complicated the situation. However, underreporting of births differed considerably in different statistical investigations.

2.4 Potential effects of program implementation procedures on underreporting of births

2.4.1 Family planning administrations and policy implementation

The roles of the SFPC and family planning commissions at each administrative level differ considerably in the implementation of the program. The central and provincial family planning commissions primarily deal with macro matters, such as policy, planning, funding and statistics. Each year, the SFPC, in consultation with provincial commissions, determines the provincial family planning targets, based on the goals set in the National Five-Year Plan for Economic and Social Development. Subsequently, these targets are assigned level-by-level to lower administrations until the grassroots level, according to the previous program performance and fertility levels at each level. The family planning commissions at the prefecture and county levels basically play administrative roles. They further disaggregate the assigned targets downward to a lower level, and also supervise the local performance and report to higher level administrations.

The majority of family planning work is carried out at the grassroots levels. In urban areas, both work units and residential areas have established family planning offices with specific personnel in charge of family planning work. In rural areas, each township in most areas has established a family planning office and a family planning service station for family planning operations. Village leaders, the party secretary and the village head take full responsibility in family planning, but normally a female deputy village head is required specifically for it. The program workers and local cadres conduct family planning mobilisations and promotions, maintain records of all women of reproductive age, distribute free contraceptives and try to persuade unauthorised couples to terminate pregnancies, compile statistics and report to their superiors. They also collect fines from couples who have had out-of-plan births. Furthermore, family planning statistics are also derived from their own records and compiled and forwarded upward. In general, local performance is of unparalleled importance in the whole program. Either the actual fertility decline, or the statistical manipulation, can be primarily traced back to the performance at the grassroots level.

2.4.2 Potential effects from program implementation procedures

During the program implementation, from the SFPC down to the basic level, the higher administrations assign family planning targets to lower levels and monitor their performance, while the lower administrations manage to achieve these targets and report their performance upward. Therefore, whether the target was hard to achieve or what the result of failing to meet targets was greatly affected the reporting of program performers. From the 1980s, the family planning program applied a target management responsibility system, which required family planning workers at each level to take responsibility. The failure to meet pre-set family planning targets could result in criticisms, deduction of rewards, or demotion of positions (Banister 1987; Scharping 2003; Smith et al. 1997). Undoubtedly, this system pushed local program workers to work hard to achieve the pre-set targets, which would be easier in advanced areas. However, in areas where the family planning work was difficult, mainly in the middling or backward areas, many local program workers had to resort

to data manipulation and falsification, especially resulting in serious distortion in the program statistics.

Before 1991, this responsibility system was applied to program workers below the provincial level, and it mainly affected the family planning statistics. However, the 1991 Decision extended the application of this system to program managers at the provincial level, and also included government leaders at each administrative level; so all government leaders at each level felt the pressure in family planning. But since most of the family planning tasks were undertaken at the basic levels, local program workers were still the most important recipients of this pressure. Any data collection operations relying on local co-operation may be affected. However, data collectors other than local program workers, and also individual couples, may have been less affected by this system.

Since the central authority called for program strengthening in 1991, there was a tendency among governments below the central level to increase pressure on their subordinates level-by-level; the most important method was to assign stricter family planning targets. Although the central authority did not tighten the targets, local governments always made some deduction when delegating them to lower-level administrations. In fact, when the SFPC consulted with provincial family planning commissions to decide the annual population targets, they had already made enough room for incompetence in some areas. However, during the downward transmission process, the targets were increasingly deducted at each administrative level, while pressure was raised until the basic level to ensure fulfilment. The lower the level, the stricter the assigned target. According to Dr Baochang Gu, one of China's leading demographers, 'if the central government sets a target of eighteen births per thousand people this year, the provincial leaders tell county officials no, they must achieve sixteen, and the county leaders tell village officials no, it must be fourteen' (cited in Hertsgaard 1997: 17). As a result, the easily completed SFPC task was reduced to being too hard to complete at the village level. For example, in 1993, the CBR estimated from the SFPC planned targets was 20.58 per thousand at the national level, but the national aggregate of CBRs at the village levels during program implementation was only about 14 per thousand (Jia and Sai 1995: 30). This

increasing deduction during the process of assigning family planning targets contributed to underreporting by program workers.

The fines collected for out-of-plan births also had an impact on birth reporting both by local cadres and by individual couples. When the Chinese government chose to impose fines on couples having out-of-plan births, the primary purpose was to prevent out-of-plan second or higher-order births. Like many social events that often had unintended consequences, there was no exception for the family planning fines. Although almost all local governments increased input in family planning, the governments in backward areas were more difficult. It was reported that for some backward areas where the local financial situation was bad, the operation of family planning institutions relied heavily upon fines for out-of-plan births. Local cadres intentionally tolerated or even encouraged rural couples to have out-of-plan births in order to collect fines (Chen 1999). In the 1990s, the SFPC publicly punished several such offenders. Interestingly, this could have opposite effects on birth reporting by local cadres and by individual couples. For local cadres, these 'out-of-plan' births would certainly not show up in the family planning statistics, as this affected the evaluation of their program performance. However, couples who had already paid the fines would consider that their births had been 'authorised'. In this case, these births were more likely to appear in surveys or censuses when the enumerators were not local cadres.

Another important factor affecting birth reporting was the SFPC and SSB measures to counteract local statistical manipulation. This was probably different from other factors resulting in underreporting, as it may result in an overcount of births with certain characteristics during investigations. In the 1990s, both the SFPC and SSB devoted much effort to improving the quality of population statistics. One important counter-measure was to conduct a more intensive post-enumeration survey after each large-scale survey. With the realisation that infant deaths and births were underreported almost in every investigation, any report with lower birth figures would be immediately very carefully examined. Consequently, the enumerators or interviewers faced strong pressure to reveal the unreported births or younger children. One possible result was that over-concerned enumerators could mistakenly register children aged one year as newborns. One study carefully reviewing the

results of SSB annual surveys from 1990 to 1994 suggested that it probably overestimated newborns (Su 1996). Other studies of the 2000 census and the 2001 survey data also reported the same phenomenon (see Guo 2004; Retherford et al. 2004). As shall be illustrated in Chapter 4, this kind of over-count culminated in the recent 2000 census.

2.5 Relationship between different data gathering agencies

Currently, three government agencies, the State Statistical Bureau, the State Family Planning Commission and the Ministry of Public Security, manage the five sources of data in population statistics. Not surprisingly, the differing departmental positions, domestic political considerations, or even international politics, all affect the data collection operations and quality of data.

It appeared that MPS passively treated population statistics as a by-product of its administered *hukou* registration system, owing to its priority of maintaining social order and controlling population mobility. Compared to the other two government agencies, the MPS had more bureaucratic inertia in updating their regulations and statistics, which partly resulted from a lack of human resources. On the other hand, both the SSB and SFPC put much effort to collecting population statistics. As parallel government departments, the SSB and SFPC had respective functions and responsibilities, and collected data through different channels. Meanwhile, they also had a co-operative, though sometimes competitive, relationship during the past two decades.

Since its establishment in 1952, the SSB had experienced ups and downs closely related to China's political-economic environment before 1978 (Banister 1987). In the 1980s, the independence and accuracy of statistics attracted wide attention as economic development and the SSB began to play more important roles. A Statistical Law was enacted in late 1983 and took effect on 1 January 1984. Its primary task was to collect timely and accurate economic statistics serving development purposes, while collecting population statistics was just one of many SSB functions. After successfully conducting the 1982 census, the SSB and provincial statistical bureaus

started to organise annual surveys to generate the official demographic estimates. From the starting point, the birth figures estimated from annual surveys exceeded those recorded in the family planning statistics. These discrepancies would suggest failures both in the family planning program and the family planning statistics under SFPC administration, and consequently resulted in conflicts between the two departments in the 1980s.

The SFPC has been pursuing its own statistical course since the early 1980s. Besides the routine family planning statistics and quinquennial retrospective surveys, it also attempted to organise sample survey annually in the 1980s, which was aborted mainly because of shortages of economic and human resources (Scharping 2003). In the 1980s, the successful performance of the SFPC in the 1982 one-per-thousand survey and 1988 two-per-thousand survey made it reluctant to use the SSB sources to evaluate the program performance, despite its awareness of serious underreporting of births in the program statistics (Chang 1992). But this situation was changed by the 1990 census, which demonstrated the problems in all other population statistics. Shortly after that, the then State Councillor Li Tieying, who was the top leader in charge of family planning, asked the SFPC to stop competition and use the SSB data. Thereafter, the SFPC finally decided to shift to rely upon SSB sources to monitor and evaluate the program progress in 1991 (Peng 1992). During the 1990s, each year the SSB released official estimates of births that far exceeded the family planning statistics, an average of 7 million from 1991 to 2000. Certainly, not all provincial family planning commissions were satisfied with this, and some of them continually protested against using the annual survey as an evaluation reference (see Cai and Zhang 2000).

The SSB was also frustrated by the 1990 census results, which demonstrated the huge shortages in the estimated annual number of births in annual surveys from 1982 to 1990 (Hu 1994). During the 1990s the SSB paid much attention in improving data quality, including changing survey procedures to carry out post-enumeration. Meanwhile, the SSB no longer published official series of total fertility, but the adjusted CBR series instead. However, in the latter half of the 1990s, the gap between the observed and adjusted fertility became increasingly wider, as mentioned in Chapter 1. Besides, the SSB statisticians became defensive about the accuracy and

completeness of their statistics. With respect to causes for such a surprising gap, the SSB statisticians tended to ascribe blame primarily to the family planning program, and suggested an increasingly worse situation (Zhang and Cui 2003).

There was another story for the SFPC in the 1990s. Frustrated by the fertility fluctuations in the preceding decade, the SFPC was eager to see a further decline of fertility in the early 1990s. However, the suspicions about data quality by demographers and international concerns of program coercion, made it very cautious in publicly discussing low fertility. In certain cases, such as the Country Report in international conferences, the Chinese government declared that China's fertility was 1.8 after the mid-1990s and early this century (Government of PR China 1994; Government of PR China 2002). Nevertheless, there was accumulating evidence indicating an accelerated decline of fertility after the 1992 survey. This offered the SFPC some confidence to initiate a shift in program priority at least in eastern provinces in response to the ICPD recommendations (Gu 2000; Zhang et al. 1996). In the late 1990s, the SFPC became increasingly confident in talking about its achievement in family planning, and the Chinese government set the goal of family planning as stabilising low fertility in the new century (CPC Central Committee and State Council 2000).

Meanwhile, given the experience of fertility upsurge after the 1984 policy adjustment, the SFPC was practically concerned about that any relaxation either in policy or in implementation could lead to a fertility rebound. On the other hand, the caution of the SFPC partly resulted from the concerns of underreporting of births, and partly resulted from the concerns of its institutional position. If the fertility was as low as observed and had been maintained for a period, this would be unfavourable to the existence of the SFPC as an independent government department (Yu 2002).

2.6 Conclusion

This chapter reviews previous research on the patterns and causes of underreporting of births, and identifies one of their major limitations is the neglect of the differences of birth records between different sources and hence the underlying causes. Many

studies have focused on the negative effects of the 1991 Decision and the following programmatic changes on the completeness of reporting of births, but largely ignored their positive effects in lowering fertility, the real improvement in program implementation, in contrast to the weak program performance in the 1980s. Moreover, it is shown that the 1991 Decision did not tighten the population target, but actually slightly loosened the original demanding goal and highlighted the importance of performing the program well.

Subsequently, this analysis examines the programmatic effects on birth reporting by individual couples, local program workers and other data collectors. It reveals that the requirements in timing of marriage and childbearing, in addition to the requirements in the number of children, have greatly complicated efforts to collecting accurate fertility data. One important implication is that not all unreported out-of-plan births were higher-order births, but actually included some essentially entitled but unauthorised first-order births, or even second-order births. It is important to note that higher-order births might have been misreported as in-plan first or second-order births, which had different effects in the respective data collections.

However, great caution is required in the interpretation of programmatic effects on birth reporting. The completeness of population statistics has also been greatly affected by other factors, including the responses from the different parties involved in statistics, the different government agencies in charge of data collections and the data-gathering approaches employed. In different population statistics, these factors differed considerably and resulted in some data-specific problems in birth reporting, which are explored in detail in the following chapters.

Chapter 3 Underreporting of Births in the *Hukou* Statistics and Family Planning Statistics

This chapter examines underreporting of births in two sets of registration-based statistics: the *hukou* statistics and the family planning statistics. These two statistics serve different administrative purposes, and are shaped by the different government agencies administering them. The most important similarity between them is that both are compiled by government officers at the grassroots level from the registrations held under their administrations and then reported up the administrative ladder to the central level. This is the fundamental difference between the registration-based statistics and the interview-based survey and census, which collect information primarily through household interviews.

During the past two decades, neither of these two sets of statistics has been employed by demographers in fertility analyses. However, they are important for finding solutions to address the controversy over data quality. The *hukou* statistics directly affect the quality of other data sources because of their fundamental role in all population statistics. The problems detected in the family planning statistics and the widespread misunderstanding of this program statistics largely affect the general interpretation of fertility data. Unfortunately, until very recently there have been few studies exploring the data-specific problems of them and their interrelationship with other data sources.

It is not sufficient to discuss the quality of data in population statistics in the absence of analysis of these two sources, and this chapter aims to fill this gap. Section 3.1 briefly reviews the evolution and changing roles of the *hukou* registration system. Section 3.2 examines the quality of the *hukou* statistics, and Section 3.3 analyses the patterns and causes of underreporting of births in the statistics. Section 3.4 further explores the relationship of the *hukou* system with other population statistics. Section 3.5 reviews the data collection operations in the family planning statistics. Section 3.6 examines underreporting of births in the program statistics and Section 3.7 describes the SFPC's measures to counter against the statistical manipulation in local

statistics. Section 3.8 explains the data-specific reasons for the serious distortion in the program statistics. Section 3.9 is the chapter conclusion.

3.1 Changing role of the *hukou* system during the past half-century

The current household registration (*hukou*) system in China was created in the early 1950s. As a socio-economic institution, it experienced huge changes during the past half-century, from being extremely important in socio-economic activity during the period of the planned economy (before 1978), to an ordinary administrative system but with diminished importance in the reform era (after 1978). Correspondingly, the reliability of the statistics derived from the *hukou* system was also greatly affected.

The *hukou* system has a long history in China, and can be dated back to as early as 1,100-700 B.C. (Zhang 1988). Over millennia and cyclical dynasty changes, it mainly served administrative purposes such as population statistics, tax collection and military mobilisation. Shortly after the founding of the People's Republic, the central government re-established the *hukou* system in cities in 1951 and then extended the system to rural areas after the 1953 census. Initially, it was designed for considerations of public security to monitor, rather than control, population distribution and movement (Cheng and Selden 1994), which was the reason why the Ministry of Public Security was charged with the registration system. But it gradually emerged as a priority to control the large number of peasants migrating to the cities following the rapid industrialisation in the late 1950s. In 1958 the People's Congress enacted the *Regulations of Household Registration*, which legally stipulated the relevant principles and registration procedures. The *hukou* system is still in operation for the time being, although it has experienced several modifications, primarily the relaxation of the control over rural-urban migration, since the early 1980s (Mallee 1995; Wang 1997).

Under the *hukou* system, every Chinese citizen is required to register in one, and only one, permanent residential location (*changzhu di*). The *hukou* status for every citizen is dually classified by residential location and occupational status: the former division of rural or urban defines one's socio-economic activity in a specified

locality, either in urban centres or in rural settlements, while the latter classification of agricultural or non-agricultural decides one's socio-economic eligibility and different relationship with the state within the established framework, though such a classification is no longer closely related to one's real occupation (Chan and Zhang 1999). Basically, urban and non-agricultural *hukou* holders refer to urbanites, while rural and agricultural *hukou* holders mean peasants, but not necessarily even during the planned economy period (Zhu 1999: 103). The *hukou* status for a newborn is acquired when being registered within one month after birth according to his or her mother's status.

The basic unit of the registration is the household and everyone is registered with a household. There are two kinds of households: (1) the family household, in which many people are living together with a family relation, or a single-person family; and (2) the collective household, including those people who are living in work units, schools or public dormitories. There are some differences for the registration procedures between urbanites and peasants. In cities, each household has a *hukou* booklet including information on all family members, and the sub-district police station keeps a household registration book including all population under the sub-district jurisdiction. These two records should match each other. In rural areas, the registration procedure is much simpler. The rural collectives keep registration books, once the commune and brigade (Zhang 1988) and now the township administration and village committee (Zuo 1993), but individual households do not hold a *hukou* booklet. It was assumed when creating the registration system that peasants should and would be less mobile. The rural household registration only needs to record information for peasants of permanent residence and four items of demographic changes: births, deaths, out-migrations and in-migrations.

The registrations of the *hukou* system rely upon self-reporting from the head of each household, in particular the demographic changes within the household. Any changes should be reported promptly to the relevant *hukou* administrations, which will make necessary rectifications in their held registrations. The basic principle of the system is that each person must match his or her registered residential location. Therefore, in most cases, an urban and non-agricultural *hukou* holder is supposed to stay in a city, a rural and agricultural holder in a village. An official approval must be obtained in

advance for migration, which also changes one's registration status. This principle that a person must match his or her registered residential location made the *hukou* system an effective source of population statistics by accurately tracking individual residence and mobility.

Many authors criticised the *hukou* system for imposing 'invisible walls' upon peasants to limit the rural-urban transformation (Chan 1994), but the registration system alone did not necessarily guarantee effective control of population mobility. It was the attachment of a series of socio-economic systems, such as the rural Commune system, and the urban rationing system for food and other daily necessities, that enabled the registration system to be an effective instrument to regulate population distribution and mobility (Cai 2000; Cheng and Selden 1994; Wang 1997). Since the early 1960s, all state-controlled resources and arrangements including free housing, employment opportunity and medical care, had been assigned to urbanites only based on their residential status, totally excluding rural *hukou* holders. Therefore, during the period from 1958 to 1978, the *hukou* system separated urbanites from peasants as if they were citizens in two different societies. In the absence of large numbers of migrants, both urbanites and peasants would be living in their due residence, and the registration system could easily track down the location and movement of anyone.

However, the power of the *hukou* system as a core socio-economic institution has been greatly weakened in the reform era, in the wake of rapid economic development and the subsequent rural-urban migration and urbanisation. From the late 1970s, the rural de-collectivisation reform not only improved production efficiency and household income, but also liberated peasants from the strict control under the Commune system. Meanwhile, the urban economic reconstruction and boom after 1978 attracted more and more rural surplus labour. Under these circumstances, in the early 1980s, the government both relaxed the strict quota-control of formal authorised migration, and modified the stipulation of peasants temporarily staying in the cities, responding to the changing reality, though still assuming they would go back to the villages.

It has been possible for rural-urban temporary migrants to live independently of the *hukou* system in cities since the mid-1980s, especially in the coastal developed provinces like Guangdong. Along with rapid socio-economic development, a series of socio-economic arrangements once attached to the *hukou* system were gradually separated from personal registration status during the 1990s, such as the food rationing system. The economic take-off in the 1990s further generated employment opportunities and resources available to temporary migrants. According to the 2000 census, by the year 2000, at least 10 million peasants, the rural *hukou* holders, were working in cities (SSB 2002b). The market-oriented reforms had already made the *hukou* system unnecessary for urbanites in most aspects, except in education and medical care. Thus, the *hukou* system was no longer considered essential in daily life for most Chinese people in the 1990s.

3.2 Completeness and accuracy of the *hukou* statistics

The *hukou* statistics derive from the registrations at each administrative level. They include the following items: (1) total number of households; (2) total population of registered permanent residents, including those who have temporarily left their registered residential location; (3) births; (4) deaths; (5) out-migrations and (6) in-migrations (Zhang 1984; Zhang and Wang 1997). The national aggregate statistics count total population with a reference time of 31 December each year.

Two inherited drawbacks affect the statistics. First, unlike other population statistics, this registration system heavily relies upon self-reporting from each household, but whether a household head reports changes in a timely fashion depends upon the incentives from the system. There were considerably different situations before and after the 1980s. Second, the legal registration period within one month could lead to reasonable registration delay. For example, births and deaths occurring in December are very likely to be missed in the current yearly statistics, and included in the next year-end statistics. Certainly, these registration delays could happen every year and cancel each other out. However, one should be cautious when comparing the year-end populations in the *hukou* statistics with those from other data sources.

Before 1982, the *hukou* statistics were the only yearly available official demographic source. Generally speaking, the completeness of birth records was good and the statistics could be used 'sometimes with adjustment and in some cases without adjustment' (Banister 1987: 17). The 1964 and 1982 censuses reported the completeness of the statistics as 99.2 percent in 1963 and 99.35 percent in 1981 (Zhang and Wang 1997: 88). To some extent this remarkable completeness benefited from the pre-census *hukou* cleanup program (*hukou zhengdun*) (hereafter the cleanup program), which aimed to correct accumulated errors in the statistics during the intercensal period (Li 1986). More importantly, it resulted from the extreme importance of the *hukou* system, and very low population mobility.

Nonetheless, the completeness of the *hukou* statistics has deteriorated seriously during the past two decades. The 1981 total *hukou* year-end population was 996.22 million, with only 0.66 million undercounts compared to figures derived from the 1982 census (Zhang 1984). However, compared to the 1990 census, during the period from January 1982 to July 1990 under-registration in the *hukou* statistics amounted to 20.24 million, on average 2.7 million each year (Zha, Zeng and Guo 1996: 48). The 1990 census provided an opportunity to update the problematic registration system, but during the 1990s, the difference between the *hukou* registered population and that from other sources became even wider. Since the SSB released the estimated number of total population each year, Table 3.1 shows the comparison of total population between the SSB-estimated and the *hukou*-registered annual series. If the SSB annual estimates are reliable, this comparison suggests that the under-registration of total population in the *hukou* statistics amounted to 27.51 million at the end of 2000 (also see Cui 2000).

Table 3.1 Comparison of total population between the SSB and MPS sources in China, 1991-2000

Year	SSB estimated total population (millions)	*Hukou* registered total population (millions)	Annual difference (millions)
	(1)	(2)	(3)=(1)-(2)
1991	1, 158.23	1, 145.11	13.12
1992	1, 171.71	1, 155.63	16.08
1993	1, 185.17	1, 165.97	19.20
1994	1, 198.50	1, 176.74	21.76
1995	1, 211.21	1, 187.88	23.33
1996	1, 223.89	1, 198.66	25.23
1997	1, 236.26	1, 209.03	27.23
1998	1, 247.61	1, 218.18	29.43
1999	1, 257.86	1, 228.12	29.74
2000	1, 267.43	1, 239.92	27.51

Sources: The SSB series are from the SSB (2002a); the *hukou* series are from the MPS (1991-2000).
Note: The annual population totals of both series include military personnel.

Prudence is needed to interpret the under-registration of the *hukou* statistics in the 1990s. First, the SSB official estimates of annual number of births were inflated to varying degrees from year to year. Accordingly, the SSB-estimated number of the total population was also likely to be over-estimated. In this case, the difference between the two sources may not be too wide as shown in Table 3.1. Second, however, there were compensating errors, such as the non-deletion of deaths and non-registration of births, in the *hukou* statistics. This has been a long-lasting problem since the 1970s. Certainly, at that time, the non-deletion of deaths was the main problem, because many households wanted to keep the benefits associated with the registrations; but the nationwide family planning program, in particular after 1979, also resulted in the non-registration of out-of-plan births (Banister 1987). However, this situation further worsened in the early 1980s, which was closely associated with the introduction of the one-child family planning program and the increasing rural-urban migration, but more importantly, it resulted from the increasingly diminished importance of the *hukou* system.

The 1982 pre-census cleanup program only reported a compensating error of 0.41 million in the *hukou* statistics, 0.4 per thousand of the census-recorded population,

but the 1990 cleanup program revealed 34.15 million omissions and 9.63 million duplications, resulting in a net under-registration of 24.52 million people, 2.17 percent of the 1990 census-recorded population (Shen 1994; Zhou 1986). For various reasons, the 2000 cleanup program outcomes were not released, but many national or local news reports during census period presented the picture at different levels. For example, it was reported in Chongqing municipality, that 130,000 deaths remained in the *hukou* system, while 68, 000 births were not registered (Xinhua News Agency 2000). Such problems commonly existed in other cities. It was reported that 50, 000 decreased persons still had *hukou* in Wenzhou city of Zhejiang province (*Xinmin Evening Newspaper* 2000), as did nearly 9, 000 in Wuhan, the capital city of Hubei province (*China Youth Daily* 2000). It can be expected that the compensating errors at the national level could be even more serious compared to those in the 1980s.

The increasing population mobility greatly affects the completeness and accuracy of the *hukou* statistics. In China, authorised migrants can change their registration both in residential and in occupational status, while the majority of temporary migrants cannot do so. According to the three most recent censuses, the figures for the temporary migrants with separate current and permanent residence at the county level were 6.58 million in 1982, 21.61 million in 1990 and 78.76 million in 2000 (SSB 1984; SSB 1993; SSB 2002b). This separation between a person and his registered residence is not limited to rural-urban migrants, but also happen with urban residential migrants, especially in big cities in the 1990s (Li 2003). Undoubtedly, this contradicts the basic principle of the system. As a result, the *hukou* statistics are no longer effective in tracking people's residence and mobility, as they were before the 1980s.

In most cases, the rural-urban temporary migrants are still included into the statistics at their home villages, their permanent residential locations. However, even in the early 1980s there had been a large number of temporary migrants without registration anywhere. According to the censuses, the figures for people without registration at the census date were 4.76 million in 1982, 8.54 million in 1990, and 8.05 million in 2000 (SSB 1984; SSB 1993; SSB 2002b). It is very likely that the births of these migrants were not registered. According to the 2000 census, more than 30 percent of recorded young migrants aged below 15 had never visited their parents'

home villages, which suggests that even if their parents were still registered in their permanent residence, these children were very likely not registered in the *hukou* system (Duan and Liang 2004: 57). In general, the *hukou* statistics have lost their role as effective vital statistics in the wake of rapid socio-economic development. Neither their completeness in registering the total population nor their accuracy in reflecting population distribution has been reliable during the past two decades.

3.3 Underreporting of births in the *hukou* statistics

The birth records in the *hukou* statistics were more problematic than the records of total population. The annual registered births in the 1980s were not available, but the results of the 1990 cleanup program well reflected the seriousness of the problem. It was reported that up to 22.19 million newborns and young children, the once out-of-plan births, were not registered before the census-taking in July 1990 (Shen 1994). The results of the 2000 cleanup program are not available, but it is possible to use the SSB annual estimates to examine the birth records in the *hukou* statistics in the 1990s (Table 3.2). It appeared that births recorded in the *hukou* system were on average 6 million fewer than in the SSB annual series from 1991 to 1999. The difference between the two sources in 2000 narrowed to 1.5 million, but this greatly benefited the pre-census cleanup program. From any perspective, the birth records in the *hukou* statistics were nearly useless.

Table 3.2 Comparison of births between the SSB official estimates and those recorded in the *hukou* statistics in China, 1991-2000

Year	SSB official estimates (millions)	*Hukou* recorded births (millions)	Annual difference (millions)
	(1)	(2)	(3)=(1)-(2)
1991	22.58	16.81	5.77
1992	21.19	15.10	6.09
1993	21.26	14.52	6.74
1994	21.04	14.28	6.76
1995	20.63	14.40	6.23
1996	20.67	14.30	6.37
1997	20.38	13.86	6.52
1998	19.42	13.43	5.99
1999	18.34	13.67	4.67
2000	17.71	16.21	1.50
Total	203.22	146.58	56.64

Sources: The SSB series are from the SSB (2002a); the *hukou* series are from the MPS (1991-2000).

There are many complicated factors resulting in underreporting of births in the *hukou* system. First, the non-registration of out-of-plan births certainly was the main cause. Some parents may have chosen to delay the registration because of fear of punishment, but others could not do so according to local policy. Many local governments required that newborns must be registered with birth permits from the relevant family planning institution; but the out-of-plan births certainly had not these permits. Some local governments permitted the registration of out-of-plan births only after their parents had fully paid the fines, and it may take time for many parents to do so. Second, infant deaths, particularly those which occurred within one month of births, were most likely to disappear in the statistics, because the system permits parents to register newborns within one month of birth. Third, during the 1990s, since the *hukou* system was no longer important as it had previously been, many people were reluctant to register or report any changes in a timely fashion if it was not necessary, even if they had no problems in doing so. For example, in the 2000 pre-census clean-up program, in Shangdong province, 675, 000 people were reported with pending registration. Among them, 220, 000 were in-plan births, making up 32.6 percent and another 55, 000 were out-of-plan births, constituting only 8.1 percent of the detected unregistered population (Zhang and Chen 2002: 76-77).

Table 3.3 Comparison of the increase of total population and the registered natural increase in the *hukou* statistics in China, 1991-2000

Year	Year-end population (millions)	Annual increase of total population from the preceding year (millions)	Natural increase registered in *hukou* statistics (millions)	Difference between annual population increase and natural increase (millions)
	(1)	(2)	(3)	(4)=(2)-(3)
1990	1, 132.74	-	-	-
1991	1, 145.11	12.37	10.48	1.89
1992	1, 155.63	10.52	8.44	2.08
1993	1, 165.97	10.34	7.95	2.39
1994	1, 176.74	10.77	7.71	3.06
1995	1, 187.88	11.14	7.73	3.41
1996	1, 198.66	10.78	7.55	3.23
1997	1, 209.03	10.37	7.28	3.09
1998	1, 218.18	9.15	6.65	2.50
1999	1, 228.12	9.94	7.20	2.74
2000	1, 239.92	11.80	8.61	3.19
Total	-	-	79.60	27.58

Source: The *hukou* year-end total population and the natural increase series are from the MPS (1991-2000).

However, it would be mistaken to believe that no out-of-plan births were included in the *hukou* registers. The concept of in-plan or out-of-plan refers not only to the number of children, but also to the timing of childbirth. As mentioned in Chapter 2, if a couple who were entitled to have a second child after four-year spacing, actually had the child within a shorter time, that birth would also be considered out-of-plan. After paying the fines, they were able to register their birth. As the *hukou* is still necessary in some life-cycle arrangements, such as education, being enlisted in the army and the allocation of blocks of land for future building construction, a large number of couples have managed to register their out-of-plan births in other ways, such as reporting them as in-migrants or adopted children (Johansson, Zhao and Nygren 1991; Zeng et al. 1993). In fact, births only refer to newborns in the current statistical year in the *hukou* statistics, and many previously underreported babies could appear as newfound children in the current statistics. This phenomenon was quite similar to that occurred in the family planning statistics, which shall be explored in Section 3.6. As shown in Table 3.3, the annual increase of total

population exceeded the registered natural increase in the *hukou* statistics from 1991 to 2000. This offers clear evidence that many out-of-plan births were actually included into the *hukou* statistics.

According to a circular jointly issued by the MPS and SFPC in October 1988, millions of out-of-plan births had been registered in the *hukou* system as in-migrants (MPS & SFPC 1988). Zeng et al. (1993) reported that the comparison of national figures for in-migrants and out-migrants resulted in a difference of 10.89 million from 1982 to 1987, on average 2.14 million each year. They concluded: 'Our field observations, however, lead us to believe that misreporting of a birth as an in-migrant increased substantially in the late 1980s' (Zeng et al. 1993: 290). The analysis in this section shows that this pattern continued in the 1990s with a difference of 19.13 million between in-migrants and out-migrants from 1992 to 2000 (Table 3.4).

Table 3.4 Annual difference between registered in-migrants and out-migrants in the *hukou* statistics in China, 1992-2000

Year	*Hukou* recorded in-migrants (millions)	*Hukou* recorded out-migrants (millions)	Annual difference (millions)
	(1)	(2)	(3)=(1)-(2)
1992	18.70	17.14	1.56
1993	18.19	16.53	1.66
1994	19.49	17.08	2.41
1995	18.46	15.92	2.54
1996	17.51	15.25	2.26
1997	17.85	15.53	2.32
1998	17.13	15.10	2.03
1999	16.87	15.00	1.87
2000	19.08	16.60	2.48
Total	163.28	144.15	19.13

Source: The *hukou* recorded in-migrants and out-migrants are from the MPS (1991-2000).

Note: The migration figures of 1991 are not available.

It appears that the annual increase of total population other than natural increase (column 4 in Table 3.3) exceeds the difference between in-migrants and out-migrants (column 3 in Table 3.4). During the period from 1992 to 2000, the difference amounted to 6.56 million, on average 0.73 million each year. It is speculated that

some of these may be 'newfound' children, who were unreported in previous years, and some may be births or young children being misreported as adopted children. There are no official figures about adoption, but some studies estimate that adopted children amounted to between 0.4 and 0.5 million from 1985 to 1987 (Johansson 1995; Johansson, Zhao and Nygren 1991). These findings are very interesting and important, because they suggest that since the 1980s a huge number of out-of-plan births have not been excluded from the *hukou* system, but appear within the system misreported as in-migrants or adopted children.

3.4 Relationship between the *hukou* system and other statistics

The relationship between the *hukou* system and the population census is quite close across the whole process of census performance. In the three most recent censuses, *hukou* status is one of the most important references to decide whether and where to enumerate a person. At the preparation stage, the *hukou* registers constitute the basis for dividing enumeration areas. The Census Offices obtain the lists of targeted households in each enumeration area based on the *hukou* registers and assign tasks to enumerators within their regions. Recognising their compensating errors caused by the omissions and duplications, the State Council decided to conduct a cleanup program for months in advance of the 1982 census. This could be regarded as a large-scale census pre-test or an informal census and it has been a necessary procedure before the census ever since. Several months before the census, according to the State Council's directive, millions of census-takers helped police in each enumeration area to inspect the *hukou* registers household by household. During this process, they devoted much effort to correcting mistakes in *hukou* registers, both those kept in police stations and those in households, and matched each person with his or her household register. Subsequently, the Census Offices at each level would update the household lists and reassign the tasks for each enumeration area.

At the census-taking stage, enumerators conducted household interviews according to the allocated household lists to inquire about household information and any changes that had occurred in the preceding year. This would make the census count a little easier than expected and ensure that the census basically reflected the number

and distribution of the population. Because of the several months time gap between the cleanup program and the formal census enumeration, there could be changes in a large number of households, so once enumerators found discrepancies between the interview results and the updated *hukou* register, they are directed to investigate the household again and carry out a cross-check with other sources. After the census, the census results were used to update and improve the household registration system. However, the population census is the only opportunity to greatly improve the increasingly deteriorated *hukou* system for each ten-year period.

Considering there was such a close relationship, to a great extent the quality of the census synchronised with that of the *hukou* statistics. Indeed, the rather complete *hukou* registrations and pre-census cleanup program ensured the success of the 1982 census and 1990 censuses (Zhang and Cui 1994; Zhou 1986), while the weakened system was partly blamed for obvious undercounts in the 2000 census (Zhang and Cui 2003). Certainly, the effects of the *hukou* system on the census appeared in many aspects, for example, many authors suggested that the *hukou*-based census criteria of residence and occupation had already not been able to reflect changing realities (Banister 1984; Zhou and Ma 2003). Moreover, the definition of individual household and collective household also affected the census operation (Zhao 2001).

The family planning statistics rely on the *hukou* registers to decide their targets. The current statistical system has been in effect since 1990, when the SSB and SFPC jointly issued a circular on *Practical Stipulations of Family Planning Statistics* (Peng 1997). Under this requirement, a married woman is supposed to be enumerated at her permanent residence, and her newborn is enumerated following her registration. However, once a married woman temporarily migrates out, she should be enumerated at the current residential location if she has left her permanent residence for more than six months, otherwise still at her permanent residence. This procedure was intended to distinguish the responsibility of family planning institutions between immigration and emigration areas because of the continual increase in population mobility. However, it actually increased the instances of non-registration. As with the census performance, it was difficult to distinguish a woman's supposed registration residence by her permanent residence and the six-month duration since her leaving that residence; this contributed to common accidental misreporting.

Moreover, because the number of births is one of the most important evaluation indicators for program performance everywhere, the family planning administrations at both a migrated woman's current residence and her permanent residence have strong incentives to deliberately miss these women, and potentially their births.

There is also a very close relationship between the *hukou* system and sample surveys, including the sample census. The only available statistics for all population below the provincial level during the intercensal period are the *hukou* statistics. Although the annual survey provides CBR series in the preceding year, they are only available at the national and provincial levels. Therefore, either the SSB annual survey or the SFPC retrospective survey must rely on them to draw the sampling frame. As the focus of both the SSB and SFPC surveys is fertility, the CBR in the preceding year is an essential index to decide the sample size. However, both of them have to draw on the *hukou* statistics' recorded birth rate, though seriously biased, to decide the sample size and ultimate sampling units. During the 1980s, the SSB used the surveyed birth rates to estimate the annual number of births based on the *hukou* registered population, which resulted in the underestimate of births (Hu 1994). After 1990, although the annual survey still draws on the *hukou* statistics to design and organise survey, it has added more *de facto* factors to the survey, including temporary migrants in the currently sampled households. Accordingly, it has increasingly improved its coverage.

In general, the *hukou* system has played a fundamental role in all population statistics. Although its close link with the population census has been widely appreciated, its interrelationship with other data sources has been less recognised. From any perspective, the effect of the weakened *hukou* system on other statistics cannot be underestimated. Some of the shortage of births in other statistics can be attributed to this rather than to outright underreporting of births.

3.5 Data collection for family planning statistics

The family planning statistics, or the program statistics, are self-reporting on program performance by lower-level program administrations up the administrative

ladder to the SFPC at the national level, serving the purpose for higher-level administrations to monitor and evaluate program performance at the lower levels.

At the initial stage of the program in the early 1970s, there were no systematic program statistics. While depending on the *hukou* statistics, the family planning departments occasionally collected some data for special purposes, such as the production figures of contraceptives and the number of family planning operations. Along with the establishment of the SFPC and its nationwide family planning networks, a uniform statistical system was also created in the early 1980s. Since then, this system has experienced several modifications (Chang 1992). The current requirements and procedures are embodied in the circular jointly issued by the SSB and SFPC in 1990 (Peng 1997). The primary program targets are women of reproductive age, in particular married women. Correspondingly, they are also the subjects of the family planning statistics. The data are collected on a *de jure* basis, mainly on women's permanent *hukou* residential status. Therefore, each married woman and her births should be counted in her permanent residential location; but the statistics have been augmented with some *de facto* factors by including in-migrated women in current residential locations since 1990.

In the first place, the program statistics are the family planning registrations held at the grassroots level. At this level, the family planning administrations should create two means for program management and generating statistics: an information card for each woman of reproductive age (*yuling funu xinxi ka)*; and a registration booklet for all women of reproductive age within the administrative boundary. The information card contains detailed information, including a woman's name, date of birth, ethnic group, educational level, occupation, marital status, contraceptives used, the number and date of pregnancies, abortions, live births and stillbirths, and information on her spouse. In theory, each card is matched to one woman and all women of reproductive age should be included in the registration. The registration booklet records information in aggregated form: (1) total population figure and population change of births, deaths and migrations; (2) marriage; (3) contraception and (4) acceptance of the one-child certificate. The accuracy and completeness of these information cards and registration booklets determine the quality of the program statistics.

The family planning statistics are summarised and compiled from these registrations by tens of thousands of program workers at the basic level. During the process of upward transmission, the statistics become abstract figures in report forms, no longer matching specific women and their births. In rural areas, township family planning offices compile aggregated township report forms based on village reported figures, and then forward them to the county family planning commissions, which aggregate all information within the county and send them further upward to provincial family planning commissions. Similarly, in urban areas, family planning offices of urban districts sum information reported by street committees and then upwardly report to provincial administrations. Normally, the reports from township to county and from street committee to city districts are made monthly, while county or city reports to provincial administrations are quarterly statistics.

In most cases, provincial family planning commissions make some necessary adjustments before further reporting to the SFPC every six months. Provincial commissions evaluate program performance at the prefecture and county level. If they have any suspicions, they will ask the counties concerned to make clarifications. Or sometimes, some provinces have conducted large-scale sample surveys to rectify the reported statistics (see Li 1991; Sun and Qing 1993; Tan 1998). In the end, all provincial statistics are reported to the SFPC, which aggregates the national statistics at each year-end. Similarly, if they have any suspicions of particular provincial figures, the SFPC will ask the provinces to give explanations, or even directly send groups to further investigate, which has been especially the case since 1993.

3.6 Underreporting of births in program statistics

Only years after its creation, the SFPC had realised the problem of underreporting of births in the routine statistics. However, in the absence of a reliable reference, it was difficult to estimate the extent of underreporting until 1988 when the two-per-thousand survey results were available (Chang 1992). The SFPC statisticians made a detailed comparison between the number of births estimated from the survey and those recorded in the family planning statistics at the provincial level in 1987. The

outcomes were not unexpected but still surprised the SFPC policy makers, because only the statistics from the three metropolitan areas of Shanghai, Beijing and Tianjin were basically complete with less than 5 percent underreporting of births. More than half of the 30 provinces underreported more than 30 percent of births; some even underreported more than 40 percent in 1987 (Su 1989).

On 24 October 1988, the official *People's Daily* published an article, acknowledging: 'it has become a fashion to manipulate the family planning statistics across the country'. This article expressed the deep disappointment of the central government and called for improvement in statistics (*People's Daily* 1988: 3). Nonetheless, the distortion of the family planning statistics in the late 1980s continued in the early 1990s. As mentioned in Chapter 1, this was closely associated with the weakening in program efforts caused by the rural reform and policy modification in 1984. As a result, fertility increased in 1984-87 and then slightly declined in 1988-89 as observed in surveys and the 1990 census, but the number of births recorded in the program statistics showed little change, despite the increase in the absolute number of women at prime reproductive age.

A number of field reports or analyses on specific areas revealed the pattern of underreporting or misreporting of births by local program workers in the program statistics (e.g. Bao 1993; Li 1991; SSB 2002a; Sun and Qing 1993; Wang 1994; Wang 1995; Xie 1990). For example, out-of-plan second and higher-order births were more likely to be unreported. The births from 'early marriage' or 'early childbearing' were also very likely to be unreported. However, aware of the cost of being detected, local program workers used many strategies to manipulate statistics rather than outright underreporting. They may misreport second or higher-order out-of-plan births as 'in-plan' first or second-order births. Like the *hukou* statistics, the recorded births in the program statistics only refer to newborns, while the non-reported births in previous years are reported as 'newfound' children in the current statistical year (Li 1991; Xie 1990). Accordingly, many local program workers intentionally left some current births unreported, but reported them in later years as 'newfound' children with the excuse of previous mistakes in statistics (Zeng 1996). This would not affect the assessment of their current performance, and probably would be praised in the future for 'disclosing' previous underreporting.

After the 1990 census, the SSB retrospectively estimated the number of births and rectified the previously released annual official estimates. Table 3. 5 shows the comparison of the number of births between the SSB census-adjusted series and the family planning statistics from 1985 to 1989. During this period, the program statistics missed 40.4 million, on average 6.7 million births, or 33.8 percent of births, each year at the national level. During the 1990s, the SFPC directly organised a series of village surveys, which were designed to represent the rural areas in the surveyed provinces. The finding of 35 percent of births being underreported in program statistics in villages of Hebei and Hubei province in 1993 was frequently referred to as first-hand evidence for the argument of data deterioration since the early 1990s. However, even if this represented the average level in all the rural areas, it was likely that the national average extent of underreporting would be lower than 35 percent, given the obviously better quality of the urban statistics. Therefore, it is not safe to argue that the program statistics became worse in the early 1990s.

Table 3.5 Implied extent of underreporting of births in the family planning statistics in China, using the SSB census-based adjusted series as a reference, 1985-1989

Year	Births registered in the program statistics (millions)	SSB adjusted series based on the 1990 census (millions)	Implied extent of underreporting of births (percent)
	(1)	(2)	(3)=100*(1-(1)/(2))
1985	13.93	22.02	36.74
1986	15.98	23.84	32.97
1987	16.55	25.22	34.38
1988	16.15	24.57	34.27
1989	16.71	24.07	30.58
Total	79.32	119.72	33.75

Sources: The SFPC annual birth series are from the SFPC (1986-1991); the SSB 1980s adjusted series are from the SSB (2002a).

It was a little complicated to evaluate the completeness of the family planning statistics in the 1990s in the absence of a reliable reference. Table 3.6 uses two sources to examine the family planning statistics: the 2000 census and the SSB annual official estimates. Using the 2000 census results as a reference, the program

statistics probably underreported 10.57 percent of births from 1991 to 1999 (column 3). Obviously, this comparison is problematic owing to the census undercounts. For example, in the year 1999, the census enumerated only 11.85 million newborns, while the program statistics registered 12.88 million births. An alternative choice is the comparison between the SSB annual series and the family planning statistics. It is necessary to keep in mind that the SSB series had already been upwardly adjusted. This comparison suggests that the family planning statistics probably have underreported 25 to 33 percent of births, on average 27.86 percent from 1991 to 1999 (column 5), as opposed to the SSB official estimates.

Table 3.6 Implied extent of underreporting of births in the family planning statistics in China, using the 2000 census and SSB 1990s annual series as references, 1991-1999

Year	Births registered in the program statistics (millions)	Births estimated from the 2000 census (millions)	Implied underreporting extent (1) (percent)	SSB official estimates (millions)	Implied underreporting extent (2) (percent)
	(1)	(2)	(3)=100*(1-(1)/(2))	(4)	(5)=100*(1-(1)/(4))
1991	16.97	20.87	18.69	22.58	24.84
1992	15.96	19.48	18.07	21.19	24.68
1993	15.70	18.60	15.59	21.26	26.15
1994	15.75	17.09	7.84	21.04	25.14
1995	15.21	17.56	13.38	20.63	26.27
1996	14.55	15.77	7.74	20.67	29.61
1997	13.88	14.96	7.22	20.38	31.89
1998	13.83	14.48	4.49	19.91	30.54
1999	12.88	11.85	-8.69	19.09	32.53
Total	134.73	150.66	10.57	186.75	27.86

Sources: The SFPC annual registration series are taken from Cai and Zhang (2000: 12); the census-estimated series are own calculations based on the census data; and the SSB annual series are from the SSB (2002a).

It has been argued by many demographers that underreporting of births in all population statistics became much more serious because of the program tightening after 1991 (Tan 1998; Zeng 1996; Zhang 1995; Zhang 1997). The program statistics were already notorious in the 1980s, and it was suspected that the extent of underreporting would amount to a surprisingly high degree, owing to its close relationship with the program. However, this comparison suggested that this was not

the case, because the 27.9 percent underreporting extent from 1991 to 1999 was 6 percent lower than the figure of 33.8 percent from 1985 to 1989. From the information available to this research, at least in the family planning statistics, there was no convincing evidence to support the argument that underreporting of births became even more serious in the 1990s than in the 1980s.

3.7 SFPC countermeasures against local statistical manipulation

As a matter of fact, the 1990 census had already made a clear conclusion on the notorious program statistics. When the SFPC finally decided to resort to the SSB data source in 1991, it seemed that it had every reason to abandon this statistical rubbish. However, given its availability at each administrative level, the SFPC and its subordinates continued to collect these statistics and devoted much effort to improving the quality. This situation is quite like what Scharping (2003: 207) pointed out: 'the system continues to be maintained, because discarding it would impair accountability and evaluation of family planning performance even more'.

3.7.1 SFPC countermeasures in improving the quality of program statistics

Since the early 1990s, the SFPC have taken a series of measures to strengthen the statistical work, including (1) highlighting the problem of data manipulation and falsification; (2) updating the stipulations for family planning statistics; (3) requiring provincial commissions to invest in the building of statistical capability at the basic level; and (4) directly conducting random quality checks, mainly village surveys, through household interviews. At nationwide conferences during the 1990s, Peng Peiyun, the then SFPC Minister (1988-1998) repeatedly criticised the underreporting problems and highlighted the importance of collecting accurate statistics (Peng 1992; Peng 1993b). Moreover, the SFPC successfully lobbied the top leaders to address this issue. For example, in the 1994 annual central forum on family planning, the then President Jiang Zheming praised the 1993 SFPC village surveys in Hebei and Hubei province and asked provincial leaders to pay attention to the improvement of statistical quality. Similarly, when SFPC survey team revealed serious problems in the family planning work in rural Shanxi province in 1999, they reported to the then

Premier Zhu Rongji, who seriously criticised the provincial leaders and asked them to make improvements (SFPC 2000a).

It was suggested that the one-veto-down system introduced after the 1991 Decision increased the pressure on local cadres to manipulate statistics (see Yu and Xie 2000; Zhang 1995). But the 1991 Decision also stipulated that one serious statistical falsification could also lead to wiping out other performance, being an important component of the one-veto-down system, which (CPC Central Committee and State Council 1991). This requirement may not ensure improvement in data quality, but at least it could deter potential statistical manipulation occurred at higher administrative levels, the provincial and prefecture levels. Many provincial commissions, such as those in Hunan, Jiangsu and Shandong, also frequently organised random surveys to target local manipulation in statistics (Cai and Zhang 2000).

The imperfect statistical procedures and requirements were considered by the SFPC to be one cause of the inaccuracy of statistics. The disorganisation of statistical offices, and the lack of specific persons for compiling statistics, were also recognised as being responsible. Consequently, the SFPC in collaboration with the SSB reformed the statistical procedures in the program statistics (Peng 1997). The SFPC repeatedly asked provincial commissions to ensure the establishment of statistical institutions and personnel recruitment, and further the necessary statistical training for personnel and funding for statistical investigations. In fact, one task of the SFPC village surveys was to push local governments to attach importance to statistical work in rural villages, in addition to inspecting the quality of local statistics.

Until the early 1990s, the SFPC had realised that the problems in the program statistics, the worst data falsification, occurred at the rural township and village levels. The problems in the 1992 survey further supported this conclusion (Jiang et al. 1996). Some provincial family planning commissions, if not involved directly, were suspected of at least turning a blind eye to local manipulations or falsifications. It was a long way to go to form the national statistics through many administrative levels from the registrations at village up to the SFPC at the top. Undoubtedly, the more numerous the layers up which the statistical data were transmitted, the more serious the distortion of the data. Therefore, the SFPC concluded that probably the

most effective countermeasure was to obtain data directly from respondents through household interviews, avoiding any possible interference from intermediaries.

Subsequently, the SFPC decided to directly investigate the rural population situation. These investigations relied upon its own staff, and recruited some additional personnel only when it was really necessary, such as those with geographic familiarity, or who could speak local dialects, but from provinces other than those sampled, to ensure that the survey remained unknown to local cadres. The first two of these series of carefully designed surveys were conducted in rural Hubei and Hebei provinces in October 1993. As expected, the village surveys revealed that local family planning statistics in rural Hebei and Hubei underreported births by an astonishing 35 percent in 1992 (Wang and Wang 1995). Two SFPC statisticians involved in the 1993 surveys described the whole process two years later. To better understand why such surveys could reveal concealed births, it is worthwhile to quote a description here.

> At the dawn of the enumeration date, the investigation team directly drove to targeted villages. Once reaching there, two team heads were responsible for seeking out village heads and other cadres to introduce the purpose to them, more importantly, ask them to provide village-held *hukou* registration booklets, women's information cards, statistical reports of births, immunisation records for newborns after 1992, etc. They also asked them to provide statistical figures of total households, number of persons in each household, lists of women of reproductive age, marriage and birth information after 1992, and then copied these materials.
>
> At the same time, other team members directly conducted household interviews family by family, without omitting any family or any person in the village. After reaching each family, the investigation members used all kinds of interview skills to inquire for information on marriages, births and adoptions, particularly from those women who had these events after 1992. Meanwhile, they also asked interviewees to present necessary materials, such as ID cards, *hukou* registers, marriage certificates, childbirth certificates and other documents. If they had any suspicions about births, they insisted on seeing the children in person and managed to persuade those women who were afraid to tell the truth. If some women did leave the village before the survey, interviewers would confirm their status by questioning at least three neighbours to make sure there was no discrepancy at all (Wang and Wang 1995: 28).

In the following years until 1999, similar village surveys were conducted primarily in rural areas in another nine provinces. The majority of them are populous agricultural provinces in middle China, which had difficulty in reducing fertility and high occurrence of statistical manipulation and falsification (SFPC 1993-2000). Not surprisingly, these village surveys were successful in revealing underreporting in local program statistics, ranging from less than 5 percent in Shangdong province in 1994, to 30 percent in Gansu province in 1995 and in Guizhou province in 1996 (Table 3.7).

Table 3.7 The extent of underreporting of births in rural family planning statistics in selected provinces in China, detected by the SFPC village surveys, 1993-1999

Year	Province	Location	Program performance before the survey	Underreporting extent in local program statistics in specified reference period
1993	Hebei	11 rural counties	Average	35 percent (1992)
	Hubei	8 rural counties	Average	35.5 percent (1992)
1994	Henan	11 rural counties	Average	Around 20 percent (1993)
	Shandong	24 rural counties	Lower than average	Lower than 5 percent (1993)
1995	Gansu	11 rural counties	Better than average	Very serious (about 30 percent in 1994)
	Hainan	18 rural counties	Average	Very serious (about 30 percent in 1994)
1996	Guizhou	18 rural counties	Better than average	22.6 percent (1992-95)
	Beijing	Floating population	-	Mean CEB less than national average
1998	Shanxi	23 rural counties	Better than average	16.37 percent (1994-98)
	Sichuan	18 rural counties	Better than average	9.46 percent (1993-98)
1999	Shannxi	15 rural counties	Average	Good
	Hubei	15 rural counties	Average	Good

Source: The SFPC village survey series are from the SFPC (1993-2000).

Note: The SFPC did not give exact figures of underreporting extent in 1994, 1995 and 1999.

3.7.2 Implications of the SFPC village surveys

The SFPC village surveys were widely considered to be successful in revealing underreporting of births in rural areas. However, the detected extent of

underreporting of births did not necessarily translate into the same extent in other statistics, particularly in censuses and surveys; it is misleading to directly relate findings in these surveys to other analyses. There are many important implications of these surveys for the general understanding of underreporting of births and data quality, but unfortunately, these have remained unnoticed until recently.

As discussed in Section 3.5, the family planning statistics are compiled and reported by local program workers, who can manipulate them at will when necessary. Recognising this problem, the most important procedure of village surveys was to exclude the interference from local cadres. The SFPC made every effort to ensure direct contacts between the interviewers and respondents. The survey results demonstrated that this strategy was successful. It is likely that respondents could still conceal out-of-plan births, but the surveys had succeeded in revealing many of them. For example, in Hebei province alone, the upward-reporting of births by the survey-sampled villages in 1992 missed out-of-plan births by an astonishing 35 percent. This underreporting was achieved by inflating the in-plan birth rate and misreporting higher-order births as first-order births. The proportion of third and higher-order births detected in the village survey was 14.7 percent, 18 times the 0.8 percent reported in local statistics (Wang and Wang 1995).

It was generally believed that couples who had out-of-plan births would conceal these births once they were questioned in surveys and censuses. However, the village surveys suggested that when the interviewers questioned individual couples in person, these respondents appeared very co-operative. Indeed, a number of field studies, undertaken by trained anthropologists or demographers, suggested that peasants were co-operative in telling of their out-of-plan births (Chen 2003; Greenhalgh 1994; Murphy 2003; Zhang 1998). It is very likely that the general perception that out-of-plan births would not appear did not come from field experience.

Many authors cited the astonishing underreporting of births in the program statistics to suggest data deterioration in other statistics, such as surveys and censuses (e.g. Goodkind 2004; Merli and Raftery 2000). However, it is extremely important to keep in mind that the detected extent of underreporting represented only the problems in

the program statistics themselves. This is well illustrated by the two separate SFPC village surveys in Hubei province. In 1993, the SFPC first-round village surveys revealed that the local program statistics in rural Hubei underreported births by 35 percent in the year 1992 (Wang and Wang 1995). Facing strong pressure after being exposed this problem, the family planning commissions in Hubei province paid much attention to improving the program statistics. In 1999, the SFPC carried out another unnoticed random village survey in Hubei. The exact extent of underreporting in local program statistics was not revealed, but the SFPC seemed satisfied with the provincial program progress achieved, and their comment of 'good' indicated that the extent of underreporting was probably around 5 percent (SFPC 2000a: 105-106).

Another important implication is that one should be very cautious in using the detected degree of underreporting in these provinces to extrapolate to the problems in other provinces or the national aggregate statistics. When the SFPC decided to randomly investigate these provinces, their accumulated problems in program performance and population statistics had already been recognised. In fact, the surveyed results just confirmed the SFPC's long-held concerns. Moreover, these special surveys revealed only the underreporting in birth registration of surveyed areas, much different from those already adjusted at the provincial level. It is easy to overestimate the degree of underreporting at the national level, if directly employing the surveyed extent of underreporting. In a widely cited paper Zeng (1996: 32) estimated the number of births as 25.96 million in 1991 and 24.40 million in 1992, using the findings from village surveys in Hebei and Hubei province. However, his estimation of the number of births exceeded any other available source. The SSB adjusted figures based on the annual surveys were 22.58 million in 1991 and 21.19 million in 1992, while the estimated figures from the 2000 census using the reverse-survival method were only 20.87 and 19.48 million, respectively.

3.8 Data-specific problems in the family planning statistics

Direct involvement in the program performance greatly increases the cost of the data quality of the family planning statistics (Banister 1987; Scharping 2003; Smith et al.

1997). This suggests that some problems may be specific to the statistics of this program, in addition to some general problems equally existing in other statistics. Under the current program, the higher-level family planning administrations assign the family planning targets to lower-level administrations and monitor and evaluate the program performance of lower-level administrations according to their reported statistics. This evaluation largely determines the level of remuneration for lower-level program workers and affects their tenure in office and opportunities for promotion. Unlike the case with other data sources, the data collectors of the family planning statistics are also program workers at the grassroots level. It is in the best interests of those lower level family planning workers to keep the reported birth figures as low as the pre-set targets, either through strict policy implementation or through falsification of statistics. This is the most important cause of the serious distortion of birth records in the program statistics compared to other sources.

It is important to distinguish the roles of program workers at different administrative levels, because their considerations in data collection and transmission differ considerably. The family planning commissions above the county level, being one among many government departments at each level, mainly engage in macro management rather than practical implementation. Accordingly, they can easily delegate the problems found either in program efforts or in population statistics to lower-level administrations. Most family planning work is carried out at the rural township and village level. Accordingly, the program workers at these levels face the strongest pressure accumulated from all higher-level administrations on the one hand; on the other, they also encounter resistance from their fellow-villagers. In addition, they are responsible for collecting the necessary statistics. Once their pre-assigned tasks in certain years were too difficult to achieve, either in parity restriction or in timing restriction, non-reporting or underreporting of out-of-plan births became a better choice.

It is equally important to recognise that the program statistics are compiled by tens of thousands of program workers at the grassroots level. Except in some eastern developed provinces, most of them had little education, with educational achievement on average less than the secondary-school level. Several field studies reported that in some villages the family planning cadres did not even know how to

fill in the basic statistical forms (Bao 1993; Li 1991; Wang 1993). However, these program workers actually maintained the women's information cards and registration booklets. Understandably, their low statistical competence contributed to the problems of the program statistics.

It is frustrating to see no progress in improving the completeness of birth records in the program statistics despite a number of measures taken by the SFPC since the early 1990s. There are very likely to be other factors affecting the quality of the program statistics. One recent study by the SFPC officials reports that there were probably up to 2.7 million women of reproductive age, and 2.1 million of married women missed from the program statistics during the period from 1996 to 2000 (see Cai and Du 2001).

Table 3.8 compares the number of first marriages between those estimated from censuses and surveys and those recorded in the program statistics. Obviously, the registered marriages were lower than the estimated series each year. If the estimated number of first marriage based on the 1990 census and the marriage pattern in the 1997 and 2001 SFPC survey are reliable, it is probable that up to 23.6 million women form their first marriage were not included in the program statistics, no matter how many births these women have had. If this was the case, it can be suggested that the huge loss of births in the program statistics may not result from the outright underreporting of births alone, but also from the exclusion of many births because their mothers had already been missed.

Table 3.8 Comparison of annual number of first marriages between those reported in the family planning statistics and estimated based census and surveys in China, 1991-2000

Year	Estimated women aged 20-29 (millions)	Estimated number of first marriage (millions)	Reported number of first marriage (millions)	Annual difference (millions)
	(1)	(2)	(3)	(4)=(2)-(3)
1991	11.90	11.30	9.40	1.90
1992	12.30	11.10	8.90	2.20
1993	12.20	11.70	8.10	3.60
1994	12.10	11.40	8.50	2.90
1995	12.00	11.00	8.30	2.70
1996	11.70	10.60	8.30	2.30
1997	11.60	10.20	8.00	2.20
1998	11.30	9.80	7.60	2.20
1999	10.90	9.50	7.70	1.80
2000	10.50	9.30	7.50	1.80
Total	116.50	105.90	82.30	23.60

Sources: The reported number of first marriage are taken from Cai and Zhang (2000: 3); the estimated number of women aged 20-29 is own calculations based on the 1982, 1990 and 2000 census; the estimated first marriage series are own calculations based on the marriage patterns reported in the 1997 and 2001 surveys.

Examination of the statistical requirements and procedures offers some clues to this possibility. In order to capture the births of migrated women, the 1990 SFPC and SSB joint circular for family planning statistics aimed to distinguish the responsibility of family planning administrations for the current and permanent residence of migrated women. As mentioned earlier, this document did not reduce, but actually increased the problems in statistics. It is true that many temporary migrants were hard to capture, but more importantly, given the importance of reducing the number of births in any administration, it was in the best interests of administrations at both the current and permanent residential locations of temporary migrants to miss them out. In practice, this strategy seemed better for local program workers than outright underreporting of births, if their pre-assigned targets were hard to achieve.

3.9 Conclusion

This chapter reviews the data collection operations and underreporting of births in the *hukou* statistics and family planning statistics, both of which affect the general understanding of the quality of fertility data. The reliability of the *hukou* statistics was greatly weakened along with the diminished importance of the *hukou* system during the reform era. The implementation of the one-child policy and the hugely increased rural-urban population mobility further worsened this situation. Given their fundamental role for other statistics, there is no doubt that the weakened *hukou* statistics also affect the quality of other population statistics. Contrary to the general impression, it is found that a huge number of out-of-plan births actually appeared in the statistics, but registered as in-migrants or adopted children.

The family planning statistics suffer from serious underreporting of births due to direct involvement in the program efforts. The double feature of local program workers also being data collectors offers them incentives and opportunity to manipulate the statistics at will. But it is suggested that the huge loss of birth records in the program statistics may not result from underreporting of births alone, while the systematic shortcomings in the statistical procedures also made contributions. The findings from the SFPC village surveys have been widely referred to as evidence of data deterioration in the 1990s. However, these surveys demonstrated that most underreporting of births came from local cadres, while individual couples were found to be largely co-operative in carefully designed interviews. Moreover, it would be misleading to directly use the detected extent of underreporting of births in local program statistics in other statistics.

Chapter 4 Underreporting of Births and Young Children in Population Censuses

It was believed by many researchers that the causes for underreporting of births existed equally in all data sources, and censuses and surveys perhaps suffered from the same extent of underreporting. However, the results of many previous studies clearly show far more complete reporting of births in both censuses and surveys than in registrations (Banister 1994; Coale 1984; Zha, Zeng and Guo 1996). This thesis suggests that the mistake in the common argument results from ignorance of the different data gathering approaches between the registration-based administrative statistics and interview-based censuses and surveys. This led to a mistaken interpretation of the extent of underreporting in censuses and surveys.

A common feature between censuses and surveys is that they obtain information directly from respondents, largely, although not completely, avoiding intermediate interference from local cadres. In addition, they share similar patterns in underreporting of births, because the primary underreporting is from respondents with common characteristics, for example, couples who have second or higher-order out-of-plan births. Nonetheless, the extent of birth underreporting differs from one source to another, being dependent on the extent of local interference, as well as on other circumstances affecting data collection, such as the weakened *hukou* system and the increasing population mobility. This chapter analyses the patterns, causes and extent of underreporting of births in population censuses, and Chapter 5 examines the same topics in sample surveys.

Three censuses are closely related to this research: those of 1982, 1990 and 2000. The 1982 and 1990 censuses were widely considered to be high accuracy, well documenting population changes in the past century (Banister 1987; Banister 1994; Caldwell et al. 1986; Coale 1984). However, the quality of the 2000 census has been in doubt, and many authors suspect that the census undercounted births and younger children on a large scale, in comparison with the annual series of official estimates (e.g. Goodkind 2004; Yu and Wang 2004; Zhang and Cui 2003). But, in the absence

of concrete evidence, it is too early to make such a conclusion, particularly when a number of in-depth analyses suggest the consistency of fertility levels and trends between the 2000 census and previous surveys (Guo 2004; Retherford et al. 2004; Zhang 2004). In addition, given the enormously increasing population mobility in the 1990s and the complicated census procedures in 2000, it is necessary to examine the census environment conducive to undercounts.

This chapter focuses on the 1982, 1990 and 2000 censuses. Section 4.1 reviews the basic features of China's modern population censuses in terms of the census coverage, the contents and the census-taking operation. Section 4.2 evaluates the quality of the population censuses in terms of age-sex reporting and census completeness. Section 4.3 examines the two patterns of underreporting of births and young children in censuses after 1982. Section 4.4 examines the major challenges for the 2000 census from new census procedures and hugely increased population mobility. Section 4.5 further analyses the effects of population migration on the enumerations of births and younger children. Section 4.6 concludes the chapter.

4.1 Basic features of the 1982, 1990 and 2000 censuses

4.1.1 Coverage and contents of population censuses

The population census is the most comprehensive population count. So far five modern censuses have been conducted in China in 1953, 1964, 1982, 1990 and 2000. The first three censuses were not taken on a regular basis and had very simple enquiries. It was not until 1986 that the Chinese government decided to organise regular decennial censuses after 1990 in the years ending in zero, supplemented by a one percent sample census carried out in the middle of the intercensal period (Sun 1997). Of the three most recent censuses, the 1982 census largely established the census-taking model for the following ones in census design, organisation, field operation and data processing. The later two included more census contents and used more advanced techniques in response to changing societies and rising demands from rapid socio-economic development.

China's census counts people largely on a *de jure* basis, but with an increasingly number of *de facto* factors in more recent ones. The census instructions stipulate that all persons who hold the nationality of the People's Republic should be enumerated at their permanent residence (*changzhu di*). This census-defined permanent residence is largely determined according to a person's *hukou*-registered residential location, but is not necessarily the same, because the duration of time a person has lived away from the registered residence has also been taken into account. For example, in the 1982 and 1990 censuses, a person who was enumerated at his or her current residential location as permanent residence must have lived there with a *hukou* registered there, or have been resided there for more than one year with a *hukou* elsewhere, or have been away from the registered residence for more than a year. Otherwise, he or she should still be enumerated at the registered residence. In the 2000 census, the duration was reduced to six months. Meanwhile, the geographic boundary to determine the difference between a person's current and registered residence was urban city or rural county both in the 1982 and 1990 censuses, but being changed to urban street, town and rural township in 2000.

The census unit is the household. The definition of two kinds of households is similar to that in the *hukou* system: the family household including both one in which many people live together with a family relation and the household of a single-person family; and the collective household. The respondents of the 10 percent long form of the 2000 census were also chosen based on households. There are two parts in the census questionnaire: one for the household, recording the information of each household member briefly, answered by the head of the household; the other for each member, recording individual information in detail, answered by each individual inside the family. The individual part of the census questionnaire also contains specific questions on childbearing information answered by only women of reproductive age.

The contents of the 1982 census were simple, collecting the basic demographic information, including name, relationship with the head of the household, sex, age, ethnicity, and current *hukou* status. But the census included socio-economic variables, such as education and employment-related items and used an internationally comparable occupational and industrial classification for the first time

(Yu 1997). The 1990 census made several important modifications of the one in 1982: one was in the definition of urban population. It proposed two different definitions to classify urban or rural population, one similar to the 1982 definition, the other including all people living within a city's jurisdiction as urban population, regardless of their *hukou* registration status. The other important change was the addition of the items concerning migration, inquiring into individual residence five years ago and the reasons for migration (Wang 2000a). Both the 1982 and 1990 censuses used 1 July as the reference date.

There were more and new elements added to the 2000 census, as had been desired by scholars and policy-makers for a long time. For the first time, the census introduced both a short form and a long form in the enumeration. About 90 percent of households received the short from with only 19 items, including the questions answered by everyone in every household. The remaining 10 percent of households received the long form, which contained detailed questions on migration, housing, employment and childbearing, amounting to 49 items. Another important change was the definition of permanent residence, which used smaller geographic units and durations of stay to include people in their current dwelling, as mentioned above. In addition, the census organisers decided to shift the reference time to 1 November, which aimed to capture more rural-urban temporary migrants at their current residence. Also for the first time, the census introduced a new form to enumerate short-term temporary migrants (*zhanzhu renkou*) at their current dwelling, who left their permanent residence less than six months before and should still be enumerated there according to the census criteria.

All three most recent censuses collected fertility data from female respondents, obtaining information from women aged 15-64 in both the 1982 and 1990 censuses, and from women aged 15-50 in 2000. There are two childbearing-related questions: one about reproductive history, the number of children ever born and surviving; the other about the newborns in the year immediately before the census. Both the 1982 and 2000 census enquired into newborns in the preceding year, and the 1990 census gathered information on newborns in the preceding 18 months by three six-month periods. While all women of reproductive age answered the childbearing questions,

in the 2000 census only women in the long-form-sampled households were interviewed with these questions.

4.1.2 Data collection and quality control of population censuses

The SSB and its nationwide subordinates are responsible for the actual census design and implementation, but the efforts to mobilise the necessary economic and human resources to prepare and conduct censuses rely heavily on governments at all levels. Normally, one or two years before the census, the State Council establishes a special leadership group and the Population Census Office, composed of high-level officials from relevant governmental ministries and organisations at the central level. This structure is copied at each administrative level downward to the rural townships, urban towns and street communities to co-ordinate census activities at all levels. Rural villager committees and urban resident committees also create population census groups for practical performance (SSB 2001). Before each census, a variety of large-scale campaigns are organised to inform the general public about the census, and make necessary preparations, especially the *hukou* cleanup program. Millions of enumerators and supervisors are recruited and given the necessary training.

All censuses so far have used the field enumeration approach, and the enumerators, rather than respondents, fill in the census questionnaire. Even for the 2000 census, the organisers still considered a 12 percent illiteracy rate as a great problem for people filling the forms themselves (Zhang 2000). To count the huge population of more than one billion, the census mobilised 5-6 million census takers and supervisors in the field operation in the past three censuses. In fact, if the people who were actively involved in the publicity and various auxiliary activities were included, this number would be much larger, up to 10 million (Yu 1997). On average every enumerator interviews 200-300 persons. Most enumerators are temporarily recruited from government agencies, schools and factories, and had little or no statistical training. It is understandable that the degree of competence of the census takers and their efforts will greatly affect the census quality. But this could be compensated for by other favourable conditions in 1982 and 1990 censuses, but not in 2000.

There have been strict quality control standards, from preparation, field operation and cross-checking after household interviews, to data entry for the censuses. One important measure is to conduct an independent post-enumeration survey, as in the three most recent censuses (Wu 2001; Yang 1994). However, it appeared that these surveys are not very effective in revealing underreporting of young children. One possible explanation is that the post-enumeration survey emphasises the check of completeness of the whole population, paying less attention to underreporting of newborns and young children.

4.2 Evaluation of the quality of population censuses

Before the 2000 census, the four previous censuses were considered to be of high quality; but this does not necessarily mean that there were no problems in previous censuses, and that the 2000 census was 'useless' as suggested by some studies (CPIRC Research Group 2003: 1; Yu and Wang 2004). A careful study may reveal the similarities in underreporting of births and young children between them and identify the specific problems in the 2000 census.

4.2.1 Age and sex reporting of population censuses

When the tabulations of the first three censuses were released to the public after the 1982 census, the good age and sex reporting in China surprised the international demographic community (see Li 1986). One researcher found that the reported number of persons by sex and single years of age from the three censuses, and the 1982 one-per-thousand survey, passed 'a series of stringent tests of accuracy and consistency' (Coale 1984: 1). Another comprehensive analysis of the three censuses concluded:

> Analysis of reported age-sex structures from the three censuses has shown the excellent quality of age reporting, the high but plausible sex ratios, and a possible tendency to undercount men 15-25 but no other age-sex groups in the population (Banister 1987: 49).

Studies about the later 1990 and 2000 censuses also suggest that there was good age and sex reporting (CPIRC Research Group 2003; Qiao 1995; Zha, Zeng and Guo 1996). The good age reporting of women and their children makes it possible to retrospectively calculate the age-specific fertility rates.

It has been generally agreed that this accurate age reporting is attributable to the Chinese lunar calendar and traditional customs valuing the date of birth in determining lifetime important events (Caldwell et al. 1986; Coale and Banister 1994). It has also been reported that there was no obvious misreporting of sex in the censuses (Banister 1987; Banister 1994); this is closely related to the fact that all the censuses use the field enumeration approach. A detailed regional analysis on the 1990 census suggested that minor problems of sex misreporting in some provinces could be attributed to mistakes in manual data entry (Zha, Zeng and Guo 1996).

No apparent age-sex selective undercount or overcount in adult age groups was revealed, except for the abnormal sex ratio at birth in the censuses after 1982, which led to hot debate among international demographers about its actual levels and causes (e.g. Coale and Banister 1994; Gu 1992; Gu and Xu 1994; Hull 1992; Johansson and Arvidsson 1994; Zeng et al. 1993). As revealed in later censuses, although the age-sex selective undercount of younger children was confirmed, in which a few more girls than boys were found to be unreported, the retrospectively estimated SRB in previous censuses was still abnormal (see Yu et al. 2003).

4.2.2 Completeness of the census coverage

The population count is the most fundamental part of a census. Two approaches are often used to examine the census completeness: using the results from an independent post-enumeration survey; and examining survival ratio of the same cohorts from one census to the next (see Anderson 2004).

In past two decades the completeness of the census coverage has declined, as illustrated by the official under-enumeration rate. The post-enumeration survey for the 1982 census reported a net underreporting rate of only 0.15 percent (Li 1986).

The 1990 census had slightly more under-enumeration, but the post-census survey reported a net underreporting rate of only 0.6 percent (Zhang and Cui 1994). However, the 2000 census was a different story. The post-enumeration survey suggested a much higher under-enumeration rate of 1.81 percent, 30 times that in the 1990 census (SSB 2002b).

The examination of the survival ratio between two neighbouring censuses is a useful approach to the problem of undercount or overcount in censuses. Figures 4.1 and 4.2 present the single years of age distribution of the same cohorts aged 10-60 in 2000 in the 1982, 1990 and 2000 censuses. The survival ratio for 1982-90 suggests that there were slight undercounts or overcounts in both censuses, but the survival ratio for 1990-2000 indicates a possible overcount problem in the 2000 census. Certainly, caution is needed in simply interpreting this as evidence of undercount in previous censuses, as the later censuses could also overcount population. In general, two subpopulation groups were more likely to be undercounted or overcounted: children aged below 10 and adult migrants aged between 20 and 40. This pattern is similar in censuses in many other countries (Anderson 2004). But in China, it is closely associated with two important social circumstances: the family planning program and the increasingly rising population mobility.

It is very important to identify the effects from these two factors over time. The family planning program has affected the reporting of births and young children since the late 1970s. As already discussed, since the mid-1980s, the rural family planning policy has been modified and kept stable; meanwhile, as the popular fertility preferences have changed and actual fertility has declined, it is likely that there were fewer out-of-plan births, so fewer of them needed to go unreported in the 1990s. There is no strong reason to believe that the program spoiled the completeness of the census more in 2000 than in 1990, as suggested by some authors (see Goodkind 2004).

Figure 4.1Single years of age distribution of males aged 10-60 in 2000 in China in the 1982, 1990 and 2000 censuses

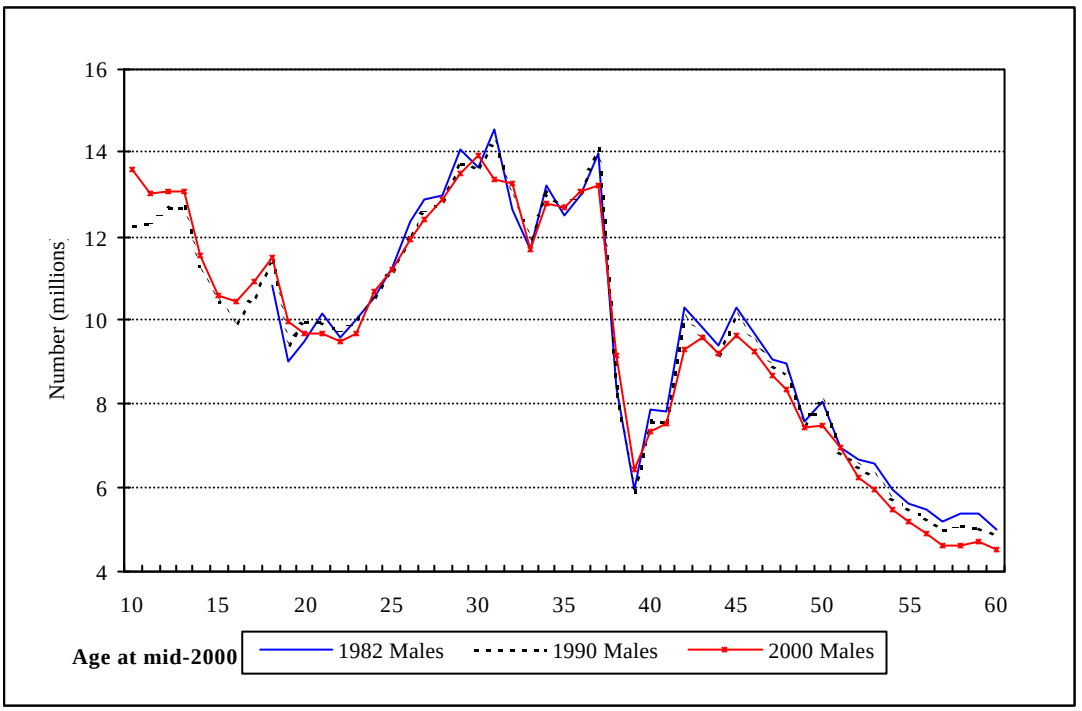
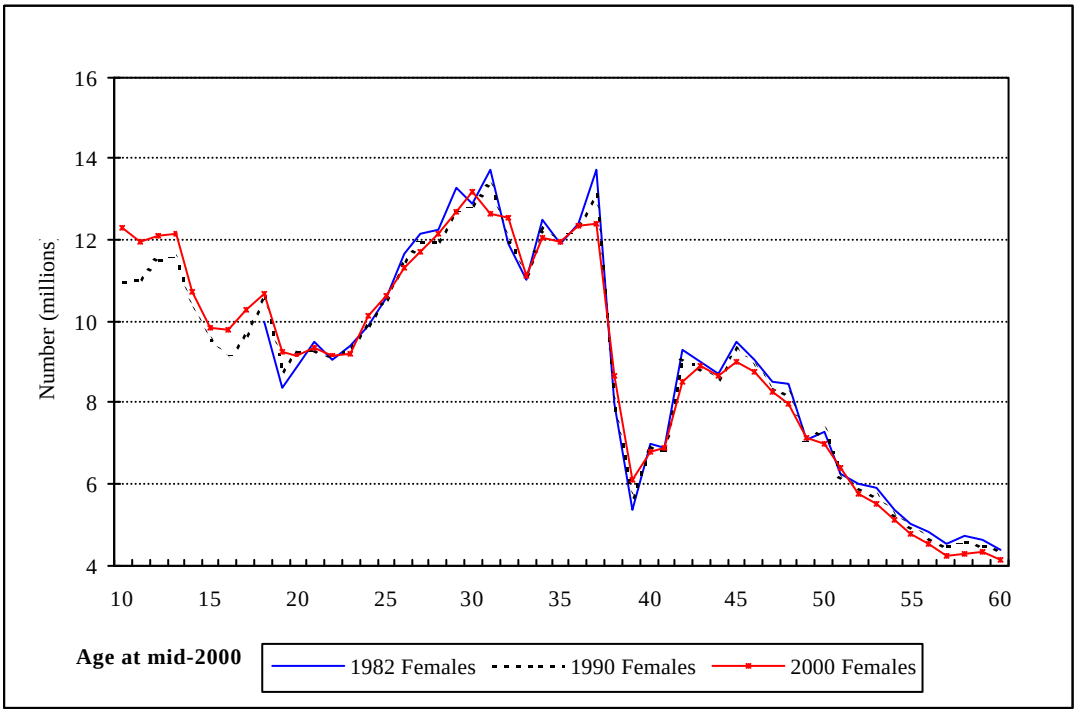


Figure 4.2 Single years of age distribution of females aged 10-60 in 2000 in China in the 1982, 1990 and 2000 censuses



Source: The census tabulations of the 1982, 1990 and 2000 census, SSB (1984; 1993; 2002b).

The rapid societal changes since the 1980s have been increasingly significant in affecting the census counting. The high quality of the 1982 census benefited from many favourable conditions, such as the then reliable *hukou* registrations, very low population mobility, and fewer effects from the one-child family planning campaign at its initial stage. But in the following 1990 and 2000 censuses, these favourable circumstances had greatly deteriorated. The most important impact came from the large-scale rural-urban and urban-urban population mobility during the 1990s.

4.3 Major challenges in the 2000 census brought by the combination of population mobility and new census procedures

The 2000 census encountered many unprecedented challenges, partly from changing societal circumstances, such as reduced funding from governments, difficulty in recruiting experienced census-takers, less co-operation from respondents and huge 'floating' population, and partly from the innovated census-taking procedures, especially the changes in the definition of the geographic location and duration of migrants (see Huang 2003; Qiao 2002; Wang 2003a; Zhang and Xu 2002).

The most important challenge of the 2000 census was the enormously increasing population mobility, which made people more difficult to catch and count. According to the 2000 census, about 144 million people, 11.6 percent of the total enumerated population, lived in a street, town or township other than their registered location. If it were taken into account that the majority of undercounted people were living in a place other than their *hukou*-registered location, this figure would probably rise to 160 million (Li 2003). Among these migrants, 42.4 million people moved across the provincial boundaries, and 36.4 million across urban city or rural county boundaries. Because of the different criteria used in the 1990 and 2000 censuses, the migration figures are not directly comparable. However, if the duration difference is ignored, the number of 78.8 million people living in a residence other than their registered city or county was about 3.6 times the figure of 21.6 million as reported in the 1990 census (SSB 1993; SSB 2002b).

It was commonly recognised among policy makers and demographers that previous censuses undercounted temporary migrants at their current residence. Therefore, a more liberal definition of permanent residence was applied in the 2000 census. One consequence of the change in the geographic boundary for permanent residence is that the census included large numbers of urban residential migrants. The economic boom brought large-scale construction of new residential buildings in urban areas; and richer urbanites, who used to live in inner cities, tended to buy new suburb residences. However, for reasons of health care, or children's education, or from diminished concern for *hukou* registration, a large number of these people did not change their *hukou* registration. It was reported that some households possessed two houses: one was registered under the name of the head of the household, the other under the name of another family member, which was more obvious in big cities than in small cities. Many such people were not migrants in a real sense, but were counted as migrants just because they lived in a residence other than the registered urban street (Huang 2003; Li 2003). One study based on the 2000 census found that in the four old inner-city districts of Beijing, 11 percent of the population were not living in their *hukou*-registered residence, while in one district of Guangzhou, 21 percent people lived in streets other than their *hukou* registration streets (Li 2003). Another study reported that in one street of Nanjing city, the capital of Jiangsu province, only 54 percent of people lived in their permanent registration residence there, and about 25 percent kept their *hukou* there while living in another street inside the city (Huang 2003). The possible outcome was that many of these people could be either counted twice, in their registration location and current residence, or missed in both locations (Duan et al. 2001).

In the previous censuses, the minimum requirement of one-year duration at the current residence ensured that most migrants would be enumerated at their permanent registration location. Despite missing most temporary migrants at their current location, the 1982 and 1990 censuses were less likely to overcount or undercount people at their permanent residential location. However, it was totally different in the year 2000. The 2000 census contained more *de facto* factors, but still heavily relied upon the weakened *hukou* registration. During the census interviews, an enumerator could not record everyone immediately in a household. In the first place, he must ascertain the *hukou* status of each member inside the family; if a

person's registration was outside the street, town or township, the enumerator must clarify the time-period since the person left his registered location and then decide whether to count this person there. One researcher complained that the census instructions and procedures were too numerous and too complicated for an ordinary enumerator to remember even after seven days of training (Huang 2003: 47). It is important to note that the great majority of the 5-6 million temporarily recruited enumerators were actually working in different jobs before the census. Understandably, most of them would have more difficulty in mastering the complexities than the professionals collecting data in surveys. Although the enumerators for the 1982 and 1990 censuses may have been in the same situation, the census-taking environment was much more favourable, so that the enumerators themselves faced fewer challenges.

During the census, all information on migration duration was given by respondents themselves and difficult to verify, or even if the enumerator recognised a mistake they still could do nothing. If a person for any possible reason did not tell the truth, the enumeration results of 'permanent' residents and 'temporary' residents would be different; or even if a person did not intentionally give wrong information, if he just left his registered location around six months ago, it would hard to tell whether it was more than six months or less than six months and hence affected the enumeration outcomes. Furthermore, if persons who should be classified as 'temporary' migrants in their current location but stated that they were there to visit relatives or as tourists or on business, they would not be counted at all. The possible situation was that some migrants were counted twice in both locations, but some perhaps were missed in both. Of the huge number of migrants, a large proportion migrated for the purposes of business, study or moving house, and were easy to catch, however, still not a small proportion had no fixed job and residence but just wandered inside cities or across cities for searching for any money-earning opportunity. The latter group of people were 'floating' population by their mobile nature, and probably did not stay in any residence for more than six months. The risk of this group of people being counted mistakenly in any residence was very high, given the complicated reality and census procedures.

The shift of the census reference date to 1 November in 2000 was intended to include the seasonal rural-urban migrants, who usually went home during the Chinese New Year period, normally in February. In fact, many rural-urban temporary migrants may go back to their hometowns in the summer harvest period, between June and July, and probably reported that they left their homes no more than six months ago. In addition, the millions of tourists during the one-week National Day holiday (1-7 October), just one month before the census, presumably complicated the case. Moreover, for practical reasons, such as avoiding the various local fees and levies, many migrants did not want to be enumerated, and hence misreported their duration of living outside. Therefore, the possible undercounting or overcounting was inevitable. As a matter of fact, the 1995 sample census used the same time-period requirement and resulted in a large undercount of migrants (Zhang, Yu and Cui 1997). Once again, as shown in the post-enumeration survey, the undercounting of migrants, in particular the 'temporary' residents (*zhanzhu renkou*), was the primary cause for the incompleteness of the census (Wu 2001).

From the perspective of census design, the new census procedures were supposed to count the total population completely and temporary migrants accurately. But in practice, these changes actually complicated the census-taking, mainly because China has been more like other countries in terms of economic development and subsequent population mobility since the early 1990s, while the census still heavily relied on the problematic *hukou* system to determine whether and where to count a migrant.

4.4 Effects of census-taking difficulties on 2000 census completeness

The effects of the census-taking difficulties brought about by the combination of population mobility and new census procedures were direct and obvious in the 2000 census. Many adults were undercounted owing to migration; on the other hand, many adults were double-counted for the same reason. Consequently, a large number of births and younger children were also missed because of their parents' migration.

4.4.1 Effects of census-taking difficulties on overcounts of adults

Originally, the task of household interviews was supposed to be completed from 1-10 November 2000. However, in the first round of census enumerations, many provinces discovered a huge shortage of enumerated population compared to those summarised from the recently updated *hukou* statistics. There were rumours that some provinces even missed millions of people compared to the 1990 census (see Lavely 2001). Then the Population Census Office decided to extend the enumeration period and told all provinces to ensure the accurate counting of migrants. Consequently, most provinces, especially those which had millions of seasonal out-migrants, faced strong pressure to find the 'missing' population (Qiao 2002). For many provinces, it was safer to record migrants than to omitting them; this greatly increased the chance of undercounting or overcounting migrants, particularly middle-aged migrants (Zhang and Cui 2003).

Figures 4.3 and 4.4 present the survival ratio of the same birth cohorts in 2000 between the 1990 and 2000 censuses. To reduce the effects arising from probable underreporting of deaths in the 2000 census, the comparisons use the average survival ratio derived from the two census life tables. The examination by age-sex group indicated irregular fluctuations of both males and females in adult age groups (20-40). Misreporting of age could be a possible cause of the fluctuations of survival curves. Using the five-year groupings, the fluctuations were smoothed but still suggest probable overcounts of both males and females aged 20-40 in 2000. One estimate suggested that the 2000 census probably overcounted 4.66 million people aged 20-45, 2.04 million males and 2.62 million females (Zhang and Cui 2003: 26). Regional analyses also support this conclusion. For example, Yu and Wang (2004) compared the cohorts aged 10-49 in 2000 in Hunan province, an emigrant-origin province, between the 1990 and 2000 census and found out that the cohorts survived well, only subject to mortality factors. However, the national census data reported that 4.3 million Hunan people moved across the provincial border, and were actually enumerated in other provinces. Obviously, Hunan province double-counted a number of out-migrants.

Figure 4.3 Comparison of survival ratios of males aged 10-60 in 2000 between the censuses and those derived from life tables in China, 1990-2000

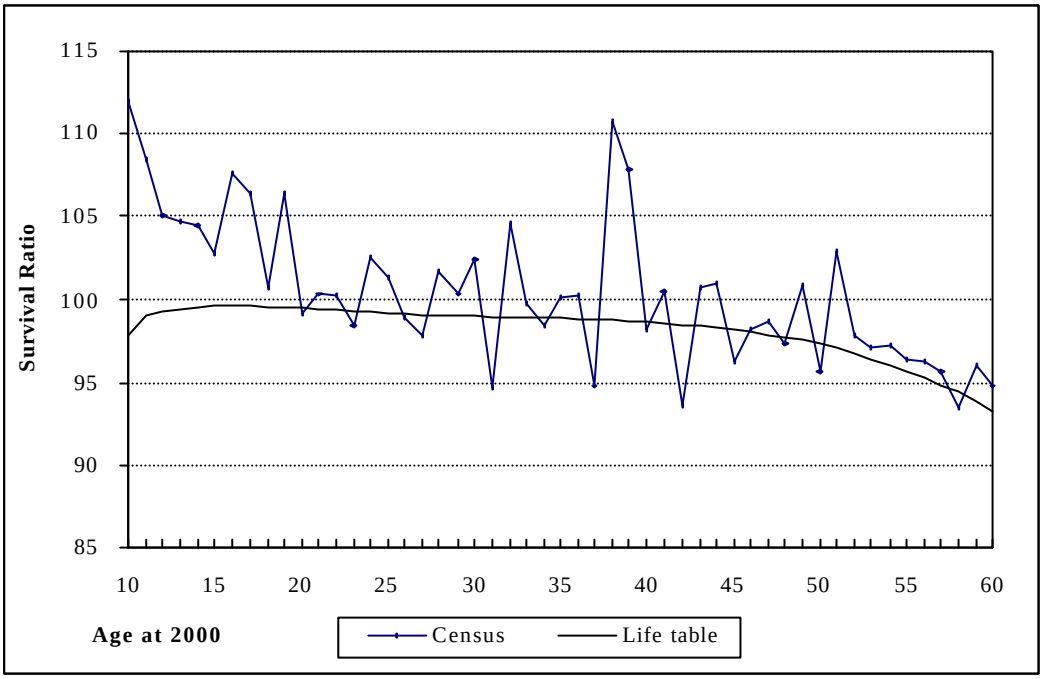
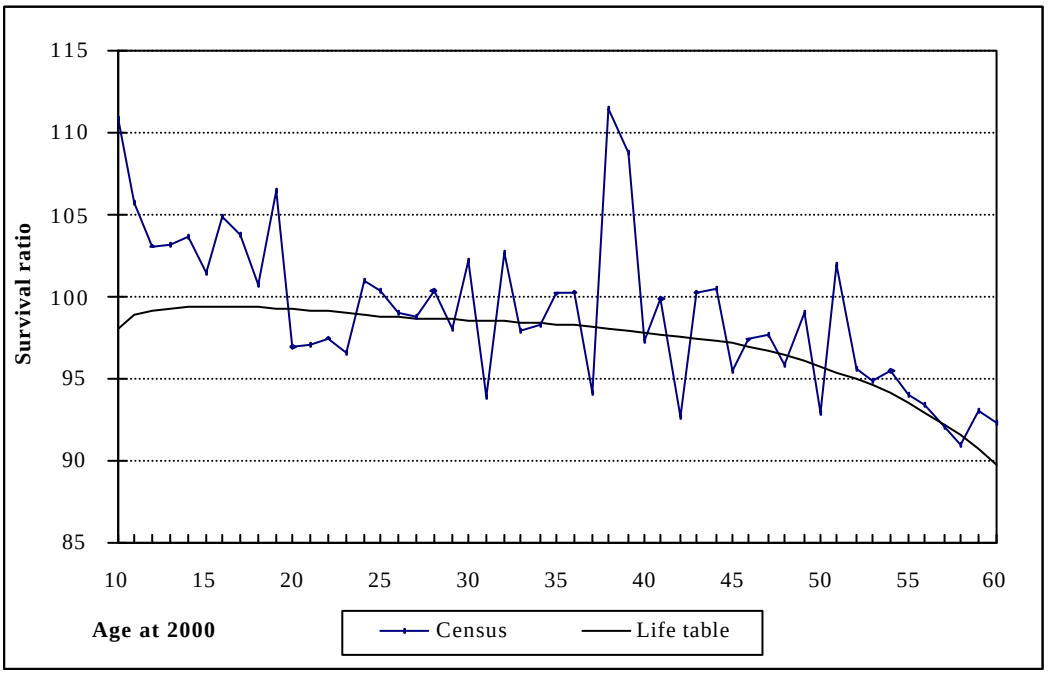


Figure 4.4 Comparison of survival ratios of females aged 10-60 in 2000 between the censuses and those derived from life tables in China, 1990-2000



Sources: The survival ratios are own calculations based on the 1990 and 2000 census tabulations (SSB 1993; SSB 2002b); the life table survival ratios are the average of the 1990 and 2000 census-based life tables.

4.4.2 Effects of census-taking difficulties on undercounts of births and young children

Given the huge number of migrants, it is probable that many births and young children were unreported owing to their previous out-of-plan status, but some may have been uncounted along with their migrated parents. This is supported by the comparison of census-recorded young children with those recorded in other independent sources. For example, as discussed in Chapter 3, the number of the census-recorded children aged one year in 2000, those who were born in 1999, was 11.5 million, much smaller than the number of 13.67 million registered in the *hukou* statistics and that of 12.88 million in the family planning statistics. As those children already appeared in the *hukou* registration and family planning statistics, it was less likely that their parents would still conceal them in the census. Even if some parents still did so for practical considerations, this was not likely to be a large proportion. An alternative, and reasonable, explanation was that they were missed because of migration, while living with their migrated parents.

The 2000 census reported a huge number of young migrants aged below 15, up to 14.4 million, 10.98 percent of all recorded migrants (SSB 2002b). It was found that more than 80 percent of these migrated children were living with their parents, others with grandparents or other relatives. More importantly, 75 percent of them had been living in their current residence for more than two years, and 30 percent of them had lived there after their birth (Duan and Liang 2004: 57). This suggested that a considerable number of young migrants aged below 15, or at least 30 percent of them had never visited their parents registered location and hence probably did not obtain *hukou* registration. As discussed in the preceding section, the census procedures resulted in huge logistics difficulties and undercount or overcount problems. It is very important to keep in mind that the 14.4 million young migrants had already been enumerated in the census. Very likely, a large number of young migrants were missed in the census. If the migrated parents were counted in their current residence, their children were probably counted with them there. However, if many migrated parents were missed in their current residence, but still counted in their *hukou*

registration, their children were very unlikely to have been counted there. In addition, if those parents were missed in both locations, their children were certainly missed.

A number of studies reported that some newborns were enumerated as family members in the individual questionnaire, but not reported by their mothers as own births in the 1988 two-per-thousand survey and 1990 census (Banister 1994; Johansson and Nygren 1991; Zeng et al. 1993). This pattern appeared again in the 2000 census. For example, the reported number of births by mothers was 1, 181, 952 in the census long form, but the enumerated children aged 0 was 1, 304, 731, 10 percent higher than that of reported births. This suggests that up to 1.2 million babies were not reported by their mothers as their own births at the census time. The above studies suggested that these unreported births were probably reported as adopted children or in-migrants. One analysis suggested that from 1985 to 1987 on average 0.4-0.5 million births were probably reported as adopted children (Johansson 1995). It was not likely that many more births were reported like this in 2000, given the declining fertility and the reduced number of annual births.

A reasonable explanation is that young mothers were temporarily migrating to other areas at the date of census, leaving their babies in their home villages with their grandparents or other relatives. During the census, these babies were enumerated as family members. However, their mothers were absent in the census long form and hence could not report these babies as own births. This is consistent with the analysis showing the difference in estimating fertility between using own-children method and direct calculation based on census-reported births (Retherford et al. 2004).

The sex ratio at birth in many provinces reported in the 2000 census was much higher than in the 1990 census. One recent study found that seven provinces, Anhui, Henan, Hubei, Hunan, Guangdong, Gunagxi and Shannxi may have had more serious problems in reporting infant mortality and sex ratio at birth, because they reported a higher sex ratio at birth and a low ratio of infant mortality (Jiang, Mi and Chen 2004). However, another study found that all these provinces had a large number of out-migrants and in-migrants. Among these provinces, Guangdong attracted 15.06 million in-migrants, while each of the other five provinces except Shannxi contributed 2-4 million out-migrants (Qiao 2003). As mentioned above, births and

younger children are more likely to be unreported if their parents are migrants, owing to the census reliance on the *hukou* registration. This research speculates that the reporting problem in SRB and infant mortality was closely associated with the large numbers of migrants.

Other relevant evidence of the impact of migration is underreporting the number of children ever born (CEB) by women aged above 40 in the census. Table 4.1 presents a comparison of the CEB number reported by the same cohorts of women and the proportion surviving in the 1990 and 2000 censuses. In contemporary China, most Chinese women had their births in their mid-20s and early 30s, and had completed their reproductive career on reaching the age of 35 and above. As shown in the table, women aged 40-44 in 2000 generally reported more children than the same cohort women in the 1990 census, but with a higher proportion surviving. This is possible as women aged 30-34 in 1990 could still have births in the 1990s.

Table 4.1 Comparison of children ever born (CEB) by same cohorts women in the censuses in China, 1990 and 2000

Age in 1990	1990 census		Age in 2000	2000 census	
	Mean CEB	Proportion of children surviving (percent)		Mean CEB	Proportion of children surviving (percent)
30	1.82	96.64	40	1.96	98.02
31	1.92	96.66	41	1.99	98.07
32	2.00	96.49	42	2.04	97.90
33	2.07	96.41	43	2.08	97.85
34	2.15	96.28	44	2.13	97.73
35	2.25	96.00	45	2.20	97.47
36	2.35	95.87	46	2.26	97.38
37	2.49	95.63	47	2.36	97.20
38	2.62	95.49	48	2.46	97.02
39	2.76	95.41	49	2.56	96.99

Sources: The 1990 series are from the 1990 census tabulations (SSB 1993: 936-939); the 2000 Series are from the 2000 census tabulation (SSB 2002b: 1234).

However, the mean CEB number reported by women aged 45-49 on average was 5 percent lower than for those aged 35-39 in 1990. For most of them, their children had already grown to school age and it was unnecessary to further conceal them, even if

they were out-of-plan births before. Moreover, because these women had already reported these children in 1990, they saw no specific reasons to conceal them in 2000. Meanwhile, the proportion of children surviving in 2000 was higher than that in 1990. As the majority of these women would stop childbearing after 1990 and mortality also played a part, there was no strong reason for the higher proportion surviving. In the absence of all census data, it is speculated that the census enumerators probably interviewed fewer women who reported their reproductive histories, as many temporary female migrants actually did not show up but were recorded in the household questionnaire as family members. Meanwhile, because of their absence, no one answered the question on birth history, or other family members or relatives may have answered the question; these were very likely to have omitted deaths. This would result in underreporting of average CEB numbers and overreporting of survival ratios.

4.5 Patterns of underreporting of births and young children in the 1982, 1990 and 2000 censuses

All the three most recent censuses have been found to underreport newborns and younger children aged below 10. There are two patterns of underreporting of children: newborns and young children were underreported in the previous census, but were revealed in the following census; and newborns appeared in the census with mothers, but were not reported as own births, as mentioned above. The first pattern is defined as ‘complete’ underreporting because these children were invisible in the preceding census, while the second pattern is referred to as ‘partial’ underreporting, as they showed up in the census but were not reported as births.

4.5.1 ‘Complete’ underreporting of births and young children in censuses

In the Chinese context, many out-of-plan babies were unreported in official registrations and censuses by their parents when they were born, but would be reported years later when they grew older, in particular when they reached the age of entering primary school. Both official educational statistics and scholarly reports

suggested that regardless of being classified as 'in-plan' or 'out-of-plan' births when they were born, the majority of children would be enrolled in primary school on reaching certain age, mostly the age of seven (Gu, Xie and Hardee 1998; MOE 1998-2003). On the other hand, after completing the 9-year compulsory education, a large number of rural children aged above 16 would join the labour migration. Therefore, it is very likely that a census is more complete in enumerating children aged 10-16 than the previous census in enumerating children aged 0-6.

The undercounts of births and younger cohorts in previous census were largely revealed by the following censuses. Table 4.2 shows the survival ratios of children aged 0-6 in 1982 and 1990, calculated based on the enumerations of the same cohorts in the 1990 and 2000 censuses. Normally, if both enumerations are accurate, the survival ratios should be lower than 100 owing to mortality. Therefore, these higher-than-normal survival ratios can be interpreted as the evidence of underenumeration of births and younger children in the earlier censuses. Nonetheless, caution is required in the assumption that the following census made a more complete count of children aged 10-16, because they were also subject to population mobility.

Table 4.2 Survival ratios of children aged 0-6 in the censuses in China, 1982, 1990 and 2000

Age in 1982	Male survival ratio (90/82)	Female survival ratio (90/82)	Age in 1990	Male survival ratio (00/90)	Female survival ratio (00/90)
0	105.86	105.72	0	110.81	111.95
1	103.88	104.32	1	105.67	108.38
2	105.24	105.16	2	103.07	105.02
3	98.45	98.33	3	103.26	104.72
4	101.43	101.19	4	103.68	104.40
5	99.82	99.62	5	101.46	102.72
6	100.08	100.19	6	104.88	107.60

Source: The survival ratios are calculated based on the census data of 1982, 1990 and 2000 (SSB 1984; 1993; 2002b).

Note: The 2000 census data have been adjusted to the mid-year population.

There are several common features of the newborns and younger children who were unreported in the previous censuses. First, the closer to the census date when the out-

of-plan babies were born, the more likely they were unreported. This is consistent with the pattern in underreporting of births and young children in surveys (Guo 2000a; Zeng 1996). The reason is that some parents of those out-of-plan births in recent years did not complete the payment of fines for the out-of-plan births or did not want to pay the fines until their children grew up. Given the huge population mobility since the late 1980s, another probable explanation is that younger children could be undercounted together with their migrated parents, in particular in the 2000 census, as mentioned earlier.

Second, the newborns and younger children, who were second or higher order out-of-plan births when they were born, were more likely to go unreported. Using the sibling information of children aged 10 in the 2000 census, Wang (2003b) retrospectively estimated that the proportion of first order births was 49.38 percent, of second-order births 33.25 percent and third and higher order births 17.37 percent of those who were born in 1990. According to the 1990 census, the percentage distribution was 51.67 percent, 30.15 percent and 18.18 percent, respectively. A comparison of birth orders suggested that 58.15 percent of those unreported births were second-order births, and 10.86 percent in higher-order births.

It is strange that 30 percent of first-order births were unreported in 1990 according to this estimation. Wang's research also suggested the age heaping of children aged 10 in 2000. As shown in Table 4.2, the survival ratios of this cohort were as high as 111, both males and females, much higher than other cohorts. It is speculated that many births in other years were probably reported as having occurred in 1990. The 1990 pre-census cleanup program revealed 22.19 million younger children without *hukou* registration, of whom 16.59 million had obtained *hukou* registration before the 1990 census (Shen 1994). The remaining 5.6 million children were expected to obtain the *hukou* in the months after the census. It is speculated that most of them may be simply registered as births in 1990. If many of them were just reported as the age in the *hukou* registration, or the census takers just copied the *hukou* registers, there would be an age heaping of the cohort aged 10 in 2000.

Third, it was found that the proportion of girls was higher than that of boys among the unreported younger children in previous censuses. One study reported that in the

1990 census, at least 5.94 percent of female births in 1989 were unreported, while only 2.26 percent of male births were missing (Zeng et al. 1993: 286). The 1990 census reported a roughly normal sex ratio of 104.9 for first-order births in 1989, but higher than 120 for second and higher-order births. It appeared that sex-selective underreporting was closely associated with family planning policy. In the late 1980s most provinces permitted the daughter-only household to have a second child. For those continuing to have female births, the higher-order births were more likely to be underreported. However, the abnormal sex ratio of second and higher-order births as the result of sex-selective underreporting alone. Recently, many field studies suggested the practice of sex-selective abortion, which had a higher chance of occurring in second and higher-order births and resulted in the abnormal sex ratio in these birth orders (Chen 2003; Chu 2001).

Using the 1989-90 census life-table and applying the reverse survival method, the comparison between the census-recorded children and re-estimated younger children suggested that the 1982 census probably underreported 4 percent children aged 0-6, and the 1990 census underreported about 8 percent children aged 0-6. Given the fact that those children with certain characteristics were most likely to be unreported, the range of 4-8 percent was very likely the proportion by which the census respondents underreported out-of-plan births. A higher proportion of such 'complete' underreporting could be expected in the 2000 census, if both young mothers and their newborns were missed through the combination of their migration and the operational problems of the census enumeration.

4.5.2 Estimation of undercounts of younger children in the 2000 census

Much doubt of the 2000 census results from its enumerating smaller younger cohorts than expected. Table 4.3 shows the comparison of annual numbers of births between the SSB official estimates and those retrospectively estimated from the 2000 census. If the official estimates are reliable, this comparison suggests that the 2000 census probably undercounted by 20 percent the cohorts aged below 10 in 2000. However, as the SSB had already made upward adjustments before releasing those estimates,

the possibility of overestimation cannot be excluded. It is more appropriate to use other independent resources.

Table 4.3 Comparison of numbers of annual births from the SSB official estimates and those from the 2000 census in China, 1991-2000

Year	SSB official estimates (millions)	Census-estimated births (millions)	Implied under-enumeration rate (percent)
1991	22.58	20.87	7.60
1992	21.19	19.48	8.00
1993	21.26	18.60	12.50
1994	21.04	17.09	18.80
1995	20.63	17.56	14.90
1996	20.67	15.77	23.70
1997	20.38	14.96	26.60
1998	19.42	14.48	27.30
1999	18.34	11.85	37.90
2000	17.71	14.08	14.70
Total	203.22	164.74	18.95

Sources: The SSB series are from the SSB (2002a); the census-estimated series are own calculations from the 2000 census data (SSB 2002b).

Owing to serious distortions in birth records, the *hukou* statistics and family planning statistics could give no help. Many authors resorted to the school enrolment data to examine the census completeness. It is a useful approach indeed, because the education statistics could record more young children compared to births recorded in the *hukou* statistics or program statistics several years ago. In fact, the SSB had already used this approach to examine the completeness of younger cohorts in their annual surveys as early as the mid-1990s (Jia and Sai 1995). But, it should be noted that the enrolment data are inflated, as local officials have political pressures to ensure the attendance rate. Furthermore, there was a common mistake in previous studies, which used the age of six as a reference age for school enrolment (see Goodkind 2004; Liang 2003; Zhang and Cui 2003). However, a careful examination suggested that in the 1990s, except in the municipalities of Beijing and Shanghai and a few developed provinces, most provinces set the age of seven as the entry standard age (MOE 1998-2003). It was found that more than 90 percent of children entered primary school at the age seven each year. Therefore, it is possible to misinterpret the

reality using age six as a reference, given the frequent sudden changes in age structure of young children.

Table 4.4 shows the comparison between the annual school enrolments from 1992 to 2003 and those aged 4-15 enumerated in the 2000 census. For the years before 1990, the number of census-recorded children aged 10-15 in 2000 appeared to be close to the corresponding number of school enrolments. As the incentives to continue hiding the children, formerly out-of-plan births, diminished when they grew older, it is reasonable to use such statistics to examine the census completeness. For the years after 1990, the comparison suggested that the census undercount of children aged 4-9 could amount to 11 million, or 9.3 percent of those who were born from 1991 to 1996, if the educational statistics were correct. Had this average underreporting rate continued from 1997 to 2000, the 2000 census may have underreported at least 18 million [=(11/6)*10]. Given the possibility of inflation in the educational statistics and the greater shortage of young children closer to the census, this is probably the optimal estimation. Although it will still need several years to make a complete comparison, this suggests that the census did seriously undercount large number of younger children. But the scale of undercounting was probably not so serious, up to 30-37 million, as suspected by some authors (Goodkind 2004; Zhang and Cui 2003).

The low figures for births and young children are not necessarily proof of serious census undercount, because of the potential inflation in educational statistics as mentioned above. It is important to look into the census data in depth and there are some important analyses of this aspect. Quite recently, Retherford and his colleagues (2004), in collaboration with the SSB, thoroughly explored the micro-sample data of the 2000 census drawing on a number of demographic techniques. Their research found that the accelerated decline in fertility was true in the 1990s, which exhibited the same trends well across the line of differential residence, educational achievement and ethnic groups.

Table 4.4 Comparison between census-estimated children aged 4-9 and school enrolments in China, 1992-2003

Age in 2000	Census recorded children (millions)	Census estimated births (1986-90) (millions)	Census estimated births (1991-96) (millions)	Year of birth	Year of enrolment	Number of enrolments (millions)
	(1)	(2)	(3)	(4)	(5)	(6)
4	15.22		15.36	1996	2003	18.29
5	16.93		17.33	1995	2002	19.53
6	16.47		16.87	1994	2001	19.44
7	17.91		18.36	1993	2000	19.46
8	18.75		19.24	1992	1999	20.30
9	20.08		20.62	1991	1998	22.01
			107.98			119.03
10	26.21	26.26		1990	1997	24.62
11	25.14	25.20		1989	1996	25.25
12	24.58	24.63		1988	1995	25.32
13	26.28	26.34		1987	1994	25.37
14	23.19	23.24		1986	1993	23.54
Total	125.40	125.67				124.10

Sources: The census recorded series are from the 2000 census tabulation (SSB 2002b); the school enrolment series are from the MOE (1998-2003).

Note: The census-estimated series were obtained by using reverse survival method, taking into account the difference in time points of registration.

4.5.3 'Partial' underreporting of newborns within the same census

It was generally believed that once out-of-plan births were unreported in the census, they would completely disappear until they were 'found' in the later censuses. However, as discussed above, this was not the case. In censuses, only married women of reproductive age answered the question on childbearing experience. There are several possibilities resulting in the incongruence of mothers and their newborns: mothers' reporting newborns as in-migrants or adopted children (Johansson, Zhao and Nygren 1991; Zeng et al. 1993); the deaths of young mothers (Gao 1993); and temporary absence of young mothers due to migration (Retherford et al. 2004; Zhang 2004). There was increasing population mobility during the 1990s, and at the census date in 2000 there were 144 million or even more moving (SSB 2002b). The last

possibility seems to be closer to reality. Using the reverse survival method, the 'actual' births can be estimated by summing the enumerated children aged 0 in the household questionnaire and the recorded deaths. Table 4.5 shows the calculated extent of 'partial' underreporting of births in 1990 and 2000 census, and as well as the 1995 sample census. A comparison between these estimated 'actual' births and the mothers' own reported births suggested at least 11.6 percent of births unreported in the 2000 census long form, while only 3.03 percent of births were unreported in the 1990 census, and 6.27 percent in the 1995 sample census. This also offers corroborating evidence of the increasing population migration in the 1990s.

Table 4.5 Partial underreporting rates in censuses and sample census in China, 1990, 1995 and 2000

Censuses/sample census	Reported births	Survivals aged 0	Infant deaths	Expected births	Underreporting rates (percent)
	(1)	(2)	(3)	(4)=(2)+(3)	(5)=((4)-(1))/(4)
1990 census (one percent sample)	248, 120	250, 343	5, 531	255, 874	3.03
1995 sample census	166, 772	172, 308	5, 628	177, 936	6.27
2000 census (long form)	1, 181, 952	1, 304, 731	32, 308	1, 337, 039	11.60

Sources: The 1990 figures are taken from Gao (1993: 1-7); the 1995 figures are from the SSB (1997; 2002b).

Note: The infant deaths in 2000 are obtained by multiplying total infant deaths with 9.5 percent sampling ratio of census long from (SSB 2002b).

Furthermore, it was found that in China the births immediately following infant deaths often went unreported, partly because of the traditional Chinese culture, partly because many people avoid recalling unpleasant events (Coale and Banister 1994). If the underreporting of infant deaths is taken into account, this type of birth underreporting is somewhat higher.

4.6 Conclusion

This chapter examines the census-taking operations and underreporting of births and young children in the three most recent population censuses, in particular the 2000 census. All censuses have good age and sex reporting, but with diminishing census

completeness. In general, the 1982 and 1990 censuses have good quality with slight undercounts or overcounts in certain age groups, but the 2000 census suffered from both undercounts and over-counts on a large scale. Although the 2000 census with innovative procedures was intended to more accurately enumerate temporary migrants, the hugely increasing population mobility and the census reliance on the weakened *hukou* registrations resulted in less complete enumeration of births and young children than in previous censuses.

Two patterns of underreporting of births and young children are identified: one is the 'complete' underreporting, which refers to the phenomenon that births and young children were unreported in previous censuses but appeared in later censuses; most of these missing children were 'out-of-plan' births. The second pattern is 'partial' underreporting, which means that births were enumerated in the same census but not reported by their birth mothers. In the 1982 and 1990 censuses, this kind of underreporting may have resulted from out-of-plan births being misreported as adopted children or in-migrants, but it is more likely that the increasing population migration, in particular that of young mothers, led to the threefold increase in the 'partial' underreporting rate from 1990 to 2000. Other factors include underreporting resulting from deaths of young mothers and from infant deaths immediately following births. All these need to be taken into account when estimating the 'true' births from census data.

Previous studies have found that censuses and surveys had more complete reporting of births than the registration-based statistics. This research further reveals the underlying causes: while registrations rely on local government workers and hence are subject to their manipulation, censuses and surveys obtain information directly from respondents, largely avoiding intermediate interference. But unfortunately, this difference has long been ignored in data evaluation and analysis.

Using the census-derived life table, it is estimated that the 'complete' underreporting rate was probably between 4 percent and 8 percent in the 1982 and 1990 censuses. The 2000 census has more severe underreporting, probably around 9-10 percent, using the education statistics. Since censuses and surveys mainly suffered from underreporting by respondents, the extent of underreporting may also be similar. On

the other hand, because each census mobilised 5-6 million enumerators across the country, local interference was inevitable. And the inadequate statistical training of millions of enumerators also contributed to the census biases. Smaller coverage, and the recruitment of trained enumerators, would very likely ensure more complete reporting of births in surveys.

Chapter 5 Underreporting of Births in the SSB and SFPC Surveys

This chapter examines the data collection and underreporting of births in the SSB annual survey and the SFPC retrospective survey. The former enquires into demographic changes, i.e. births, deaths and migrations, from sampled households during the one-year period immediately before the survey, while the latter gathers detailed marriage, fertility and contraceptive histories from women of reproductive age. Both surveys collect information from respondents directly through a household-interview approach, and are reasonably expected to have more complete reporting of births than censuses, because they have employed much fewer enumerators, with more training in interview skills, to conduct in-depth enquiries.

Data from both surveys have been widely used by demographers and policy makers in fertility analyses, and to inform us of the population changes to date. The annual survey has provided the basic sources for official demographic estimates since the early 1980s, but its reliability in estimating annual number of births in the 1980s were questioned by demographers (Feeney et al. 1989), which was further demonstrated by the 1990 census (Hu 1994). During the 1980s, the most reliable information on the levels and trends of fertility came from the SFPC surveys conducted in 1982 and 1988. However, during the 1990s, the problematic features of the 1992 survey made the quality of the retrospective survey suspect. The small sample size and the SFPC-restricted release of the 1997 and 2001 survey data to the public further reduced their influence. Accordingly, both demographers and policy-makers more frequently used annual surveys in fertility estimation.

It is of great importance to examine the problems in each source and to compare the systematic differences between them. Section 5.1 introduces the data collection operations of the SSB surveys. Section 5.2 explores underreporting of births in the SSB surveys and quantifies the extent of underreporting in the surveys before and after the 1990 census. Section 5.3 describes the data collection operations and characteristics of the three most recent SFPC surveys. Section 5.4 examines

underreporting of births and the internal consistency and discrepancies between the three surveys. Section 5.5 compares between the SSB and SFPC surveys to illustrate the systematic differences in patterns of underreporting of births. Section 5.6 is the conclusion.

5.1 Data collection operations of the annual survey

After successfully completing the 1982 census, the SSB began to organise an annual sample survey for population change, replacing the *hukou* statistics as the basic source for official demographic estimates. The annual survey focuses on population changes in the preceding year, primarily births, deaths and migrations. It was decided that no annual survey would be conducted during the years of the sample census and population census (Sun 1997). So far two sample censuses have been conducted in 1987 and 1995, and they are much like the annual survey in their data collection efforts, despite their census-like questionnaire and the large-scale mobilisation of enumerators. This is also the case with the 2000 census long form.

The annual survey is the only available source of information on population changes on a yearly basis. After the completion of each survey, the SSB makes necessary adjustments according to the 'sampling and investigation errors' (SSB 1991-2002). Subsequently, the main demographic figures at the national level in the preceding year, such as the crude birth rate, natural increase rate, and estimated annual number of births, are released in the *Communiqué of National Economy and Social Development* in February of each year. The tabulations of unadjusted data, though some important items were intentionally missed in some years, can be accessed in the SSB edited *China Population Statistics Yearbook*.

During the past two decades, the annual survey has undergone substantial changes, including the reference date, sample size, and coverage of survey subjects, in responding to changing conditions and government demands. Since the late 1980s, the annual survey has been a stratified, multi-stage cluster and proportional probability sampling survey. The national sample covers about 1.2 million people, well representative at both the national and provincial levels. In practice, some

provinces enlarge the local sample size in the light of local conditions. The annual survey uses the household as the enumeration unit, and applies the census criterion to determine where and whether to count a migrant in sampled households (see Chapter 4). Since 1993 the one-year reference time period has been set from 1 October of the preceding year to 30 September in the current year, which was from 1 January to 31 December before that (see Hu 1994; Jia and Sai 1995; Li 1990; Wu 1997).

Both the SSB and provincial statistical bureaus design the survey, but the provincial bureaus and their subordinates practically carry out the annual survey. In order to ensure that the survey is representative and to reduce sampling variation, the SSB and provincial statistical bureaus have a complicated procedure to decide the ultimate sampling units. First, the SSB treats every province as a stratum, but the provincial statistical bureaus make stratification at the county level, taking several factors into account, including the proportion of agricultural and non-agricultural population, the level of socio-economic development and geographical conditions. Second, for economic and management reasons, most provinces have roughly the same sample size around 40, 000, except for the three metropolitan areas, Beijing, Tianjin and Shanghai with smaller sample sizes and some populous agricultural provinces with somewhat sample sizes. Third, each province makes a three-stage self-weighted sampling procedure at the county, township and ultimate sampling area levels. Normally 25 percent of the counties are sampled; in each county 4 to 8 towns. The sampling area, the urban resident group and the rural village group, is the ultimate sampling unit, with 250 people or so, and each sampled town has two such kinds of areas. For example, the 1997 survey enumerated the people of 31 provinces, 864 counties and 3, 164 townships living at 4, 438 enumeration areas (SSB 1998: 1).

The survey contents focus on the population changes, but the SSB sometimes adds some items for specific purposes. The survey questionnaire has two forms: one for the household, the other for individuals. The household form includes summary items, such as household type, address code, total number of household members at the time of survey, births, deaths, in-migrants and out-migrants in the preceding year. The individual form contains questions for all respondents and some only for women of reproductive age: for all respondents, name, relationship with the household head, household registration status, sex, age, ethnic group, marital status; for women of

reproductive age, date of first marriage, number of children ever born and survivors, births in the preceding year and parity status.

The annual survey uses the field enumeration approach. In each enumeration area, one or several trained interviewers, from the county statistical bureau or sometimes from the township statistical office, arrange to conduct household interviews. In addition, an instructor is designated to monitor the interview process and make a preliminary examination of results. Local officials and family planning cadres were largely avoided in the 1990s unless some special help was needed; in the 1980s the situation was completely opposite. Note that the interviewers themselves, rather than the respondents, are responsible for filling in the survey questionnaires.

Table 5.1 Basic statistical indicators of annual surveys in China, 1991-2000

Year	Crude birth rate (per thousand)	Sample size (millions)	Sample ratio (per thousand)	Sampling error (per thousand)
1991	19.68	1, 929, 141	1.666	0.23
1992	18.24	1, 810, 939	1.546	1.19
1993	18.09	1, 303, 734	1.100	1.39
1994	17.7	1, 281, 346	1.070	0.98
1995	17.12	12, 565, 584	1.04 percent	0.73
1996	16.98	1, 246, 243	1.028	1.37
1997	16.57	1, 242, 799	1.016	1.30
1998	15.64	1, 243, 377	1.010	n.a.
1999	14.64	1, 211, 965	0.976	n.a.
2000	14.03	118, 067, 424	9.50 percent	n.a.

Sources: The annual series of crude birth rates and sample sizes are from the SSB (1991-2002); the annual series of sampling error for crude birth rates are taken from Wu (1997).

Note: The 1995 and 2000 data are from the 1995 sample census and 2000 census long form, respectively.

With a huge sample size of more than one million people, it is not difficult to control the sampling error. The crude birth rate is one of the most important indicators and the SSB required that the permissible error and the relative error should be controlled at the 95 percent confidence level within 1-1.5 percent and 10 percent, respectively (Hu 1994: 23). It appeared that these standards were met very well. Table 5.1 shows the sampling errors of the crude birth rate in annual surveys from 1991 to 1997. One

detailed analysis reported that the sampling errors of the crude birth rate were around 10 percent of the overall sampling errors (Wu 1997: 53). From the perspective of sampling representation, the annual surveys performed very well. However, in the current Chinese political-social-cultural context, fertility indices are most frequently, if not always, affected by non-sampling errors, particularly intentional underreporting of births.

5.2 Underreporting of births in annual surveys and problems in estimating the annual number of births

The annual survey suffers from underreporting of births like all other statistical investigations, but it has at least two conditions favourable to better quality. First, the SSB and its subordinates are distant from the family planning program, whose government functions are to gather accurate and reliable population statistics. The statistical bureaus are government departments parallel with the family planning commissions at each administrative level. Accordingly, the accuracy and completeness of the data they collect, rather than the number of births reported, is the primary criteria for evaluating their work. Second, the interviewers for the annual survey are mostly staff with the necessary training in interview skills from statistical bureaus at the county level or above. It is reasonable to expect annual surveys to have somewhat more complete reporting of births than the SFPC sources.

5.2.1 Underreporting of births in surveys in the 1980s

Primarily on the basis of annual survey and after some degree of upward adjustment, the SSB estimates the annual number of births, deaths and total population at the national level in the preceding year. It was the 1990 census that demonstrated the serious underestimation of the survey-estimated population, and hence the annual surveys were found to have serious underreporting of births in the 1980s (Column 1-4 in Table 5.2). As shown in the first two columns, the numbers of year-end population from the two sources were nearly equal in 1982, but the census–adjusted population was 1,127 million in 1989, 15.1 million more than the corresponding

figure of survey-estimated 1,111.9 million. This comparison suggests an underestimation of 1.9 million births each year, or on average 91.6 percent completeness of the survey-estimated births during the period from 1982 to 1989 (column 7 in Table 5.2). In some years, there was a large margin between the two sources, for example, 12-15.6 percent of the implied completeness in 1984 and 1985. These results not only convinced the SSB statisticians (Hu 1994; Jia and Sai 1995; Zhang, Yu and Cui 1997), but more importantly the SFPC leadership, that the annual surveys seriously underestimated births (Peng 1993b). During the following years, this has become a powerful reason for demographers and policy makers to make upward adjustments of the survey results.

Table 5.2 Comparison between the census-adjusted and the SSB survey-estimated year-end population, crude birth rate, annual number of births, and the implied completeness in China, 1982-1989

Year	Census-adjusted year-end population (millions)	Survey-estimated year-end population (millions)	Census-adjusted crude birth rate (per thousand)	Surveyed crude birth rate (per thousand)	Census-adjusted births (millions)	Survey-estimated births (millions)	Implied completeness for estimated births (percent)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)=100*(6)/(5)
1982	1, 016.5	1, 015.9	22.28	21.09	22.38	21.27	95.04
1983	1, 030.1	1, 027.6	20.19	18.62	20.58	19.03	92.47
1984	1, 043.6	1, 038.8	19.90	17.50	20.55	18.08	87.98
1985	1, 058.5	1, 050.4	21.04	17.80	22.02	18.59	84.42
1986	1, 075.1	1, 065.3	22.43	20.77	23.84	21.97	92.16
1987	1, 093.0	1, 080.7	23.33	21.04	25.22	22.58	89.53
1988	1, 110.3	1, 096.1	22.37	20.78	24.57	22.62	92.06
1989	1, 127.0	1, 111.9	21.58	20.83	24.07	23.00	95.55

Sources: The census-adjusted series of population (1), crude birth rates (3) and births (5) are from the SSB (2002a); the survey-estimated series of population (2) and crude birth rates (4) are taken from Hu (1994: 26); the survey-estimated series of births (6) are results of multiplying surveyed crude birth rate by person-years lived, which was calculated as average of population at the beginning and end of year in column (2).

Notes: The census refers to the 1990 population census; the 1987 survey refers to the 1987 one percent sample census.

However, it would be misleading to estimate the extent of underreporting of births in the annual survey from the comparison of the number of births, because two factors contributed to the shortage in the survey-estimated number of births: the accuracy of information obtained from respondents, and the completeness of the sampling frame. It is necessary to emphasize the effects of the weakened *hukou* statistics on the quality of the annual surveys. From 1982 to 1989, the SSB not only used the *hukou*-registered population as the sampling frame, implying the under-coverage of annual surveys, but more importantly, used this population as a basis to estimate the number of births with the surveyed crude birth rate (see Hu 1994; Li and Zhang 1992; Qiao 1995). Consequently, the heavy reliance on the *hukou* statistics became an important cause of the under-estimation of births.

This can be illustrated by the exercise of using the census-adjusted population to estimate the number of births with the survey-estimated crude birth rate. As shown in Table 5.3, along with the increasing gap between the census-adjusted number of births and the survey-estimated number of births due to accumulated shortages, the incompleteness of the base population contributed more to the shortages in the survey-estimated births, ranging from 1.8 percent in 1982 to 26.6 percent in 1989. This implies that the completeness of later surveys, such as the 1989 annual survey, may be better than the estimation based on comparison of estimated number of births.

Consequently, it is proper to estimate the extent of underreporting of births in the SSB surveys by examining the difference between the census-adjusted total fertility series and those estimated from the surveys. Since the survey figures before 1985 are not available, Table 5.4 shows the comparison between the implied completeness of the survey-estimated fertility and the survey-estimated births (column 7 in Table 5.2). As can be seen, the implied completeness of the annual survey was on average 94.25 percent from 1985 to 1989, 2.85 points higher than the figure of 91.4 percent from the comparison of number of births during the same period. If the average extent of underreporting of births in annual surveys was 5.75 percent, this was certainly a better estimate than the registration-based statistics. However, because the 1990 census also underreported births, it is very likely that the ‘true’ underreporting extent was somewhat higher. One analysis estimated that the 1990 census probably

underreported on average 9 percent from 1986 to 1989, with the assumption that the enumeration of children aged 11-14 was correct in the 2000 census (see Retherford et al. 2004: 19). The use of education statistics suggested about the same extent of underreporting of births (see Table 4.4 in Chapter 4). If this was the case, it suggested that annual surveys probably underreported around 6-15 percent births during the period from 1986 to 1989.

Table 5.3 Difference of annual number of births between the census-adjusted series and the survey-estimated series, attributable to the shortage in base population in China, 1983-1989

Year	Census-adjusted mid-year population (millions)	Survey-estimated mid-year population (millions)	Census-adjusted crude birth rate (per thousand)	Surveyed crude birth rate (per thousand)	Census-adjusted births (millions)	Survey-estimated births (millions)	Re-estimated births (millions)	Incompleteness attributed to fewer base population (percent)
	(1)	(2)	(3)	(4)	(5)=(1)*(3) /1,000	(6)=(2)*(4) /1,000	(7)=(1)*(4) /1,000	(8)=100*(1-((5)-(7))/((5)-(6)))
1983	1, 023.3	1, 021.8	20.19	18.62	20.66	19.03	19.05	1.75
1984	1, 036.8	1, 033.2	19.90	17.50	20.63	18.08	18.14	2.49
1985	1, 051.0	1, 044.6	21.04	17.80	22.11	18.59	18.71	3.26
1986	1, 066.8	1, 057.9	22.43	20.77	23.93	21.97	22.16	9.48
1987	1, 084.0	1, 073.0	23.33	21.04	25.29	22.58	22.81	8.55
1988	1, 101.6	1, 088.4	22.37	20.78	24.64	22.62	22.89	13.54
1989	1, 118.7	1, 104.0	21.58	20.83	24.14	23.00	23.30	26.64

Sources: The census-adjusted mid-year population (1) is obtained as the average of population at the beginning and the end of year from column (1) in Table 5.2; the census-adjusted (3) and survey-estimated (4) series of crude births rates from the same sources of Table 5.2.

Notes: 1.The re-estimated births (7) are obtained by multiplying the census-adjusted mid-year population with survey-estimated crude birth rate; the calculated census-adjusted (5) and survey-estimated (6) births are slight different with those from the SSB (2002a) (see column 5 & 6 in Table 5.2).

Table 5.4 Comparison of implied completeness of survey-estimated fertility and number of births in China, 1985-1989

Year	Census-estimated total fertility	Survey-observed total fertility	Implied completeness for estimated total fertility (percent)	Implied completeness for estimated births (percent)
	(1)	(2)	(3)=100*(2)/(1)	(4)
1985	2.39	2.05	85.77	84.42
1986	2.38	2.29	96.22	92.16
1987	2.57	2.46	95.72	90.44
1988	2.39	2.31	96.65	93.16
1989	2.24	2.17	96.88	96.80
Average			94.25	91.40

Sources: The census-estimated total fertility series (8) are taken from Feeney and Yuan (1994: 383); the survey-observed total fertility series (9) are from the SSB (1986-1989; 1990a); the implied completeness for estimated births (4) is from column (7) in Table 5.2.

Notes: The census refers to the 1990 population census; t he 1987 survey refers to the 1987 one percent sample census.

There were several reasons for the serious underreporting of births in the annual surveys in the 1980s. The policy relaxation in 1984 and the subsequent chaos of program performance in rural areas were certainly the primary reason for serious underreporting in statistical investigations; but a more careful examination reveals that shortcomings in the surveys themselves should also be blamed. During the 1980s, the annual survey counted people only at their permanent residential location. For example, the 1989 survey stipulated that the survey investigated either agricultural households or non-agricultural households only in the areas with mixed *hukou* holders, according to the sampled household type (SSB 1990b). Consequently, the temporarily migrated peasants and their newborns would be omitted outright in the survey even if their current residential location in cities or urban suburbs was sampled. In fact, the annual surveys did not have a clear instruction to register newborns of temporary migrants. For example, it stipulated that newborns of female migrants who had not changed *hukou* registration should be registered in the original registration location; otherwise they were counted in their current residence (Li and Zhang 1992). This requirement resulted in the missing of births to rural-rural migrated women. In most cases, rural women were married out from their mothers'

villages, which were within the same townships or in the same counties, but not all of them would change their *hukou* or changed them in a timely fashion. This enabled them to keep a portion of contracted land in their mothers' villages, because they could not get them in their husbands' villages. This situation was only changed after 1989.

5.2.2 Underreporting of births and the SSB countermeasures to improve data quality in the 1990s

Starting from 1989, the SSB took a number of important measures to improve the quality of the annual survey, including changing the reference period, counting population with more *de facto* factors, and revolving the samples every year. It seemed that the quality improved compared to the previous performance. For example, the difference between the survey-estimated and census-adjusted total fertility was reduced to 0.07 children per woman in 1989, implying 3.2 percent underreporting of births (see Table 5.4).

The 1990 annual survey conducted on 1 January 1991 reported that the total fertility was 2.24. Compared to the 1990 census result, the SSB seemed happy with the performance of the annual survey (SSB 1991b: 297). But the SSB did not release as usual the age-specific fertility rates for 1991 and 1992, which, nonetheless, can be reconstructed according to the graph in the SSB statisticians published paper as 1.82 in 1991 and 1.69 in 1992 (Sun and Hu 1993: 24). Obviously, serious underreporting of births in all statistical investigations in the 1980s exposed by the 1990 census on the one hand, and the very low fertility estimated from the 1991 and 1992 annual surveys on the other, made the SSB statisticians become very cautious. Probably because they were kept secret, these figures did not provoke controversy as the 1992 SFPC survey did when its results were released to the public in early 1993 (Kristof 1993). Nonetheless, the controversial 1992 survey seemed to offer corroborating evidence to the SSB statisticians for serious underreporting in the annual survey.

Consequently, despite many important changes being undertaken for the performance of annual surveys, the SSB ceaselessly emphasised the importance of

fighting underreporting of births over the course of the 1990s. Accordingly, the statistical bureaus at each level felt strong pressure to investigate the 'true' population situation, and in turn they exerted strong pressure on surveyors to reveal 'unreported' births. One article from the SSB statisticians described the numerous measures taken by different interviewers during the process of conducting the annual survey:

> When investigating the household, the interviewers asked for information about the next household, meanwhile, they checked back to the records of the previous household, while enquiring about the next one. Some visited hospitals, epidemic prevention stations and midwives to examine fertility information from many different perspectives. Some provinces send statistical staff back to their hometown if villages were sampled in order to further understand the background. In some provinces, the statistical personnel pretended to be salesman displaying children's clothes and thus collected information on younger children in sampled villages… (Jia and Sai 1995: 30).

Among all the countermeasures against underreporting of births, the most important one was to carry out a more intensive post-enumeration survey shortly after the completion of each annual survey starting from 1993. One advantage for the post-enumeration survey is that a small number of trained statisticians can conduct in-depth interviews and also exclude local interference. In fact, this was the practice of the SSB and provincial statistical bureaus, which sent their own staff to carry out field interviews. It was reported that the SSB and provincial statisticians re-interviewed 2 percent of the sample households covering 300, 000 people to check the data quality in 1993 and 1994 (Jia and Sai 1995). These surveys quantified the extent of missing births in each survey and actually constituted the basis for their upward adjustment of the survey data. Moreover, as Jia and Sai described, the SSB also used data from other sources to corroborate their adjustment, such as the school enrolment statistics from the Ministry of Education, and the vaccine records from the Ministry of Health.

However, the very low fertility continually observed in surveys, and more importantly, the widespread distrust of data quality, pushed the SSB to make a large degree of upward adjustment in their published official demographic estimates. It

was reported in a paper from two SSB statisticians that the post-enumeration survey revealed 6.9 percent underreporting in 1993, equal to 1.12per thousand error in CBR, and 6.4 percent underreporting in 1994, about 0.98 per thousand missing births in CBR, but in the end they made a 2.51 per thousand upward adjustment in 1993 and 2.38 per thousand in 1994, amounting to 5.83 million births in these two years (Jia and Sai 1995: 30). The SSB statisticians actually defended themselves in this paper against suspicions that they did not make enough upward adjustment.

The post-enumeration survey results, or the detected extent of underreporting of births in other years, were not available over the decade. Very recently, a research paper from the China Population and Information Research Centre (CPIRC), which claimed it was offered the SSB unadjusted data, revealed the CBR series estimated from the unadjusted survey data (CPIRC Research Group 2003: 9). In comparison with the SSB official estimates, the SSB correction factors each year can be estimated, ranging from 7 percent to 19 percent from 1991 to 2000 (Table 5.5). The upward adjustment amounted to 27.5 million births over the decade, compared to births estimated from the unadjusted survey data (CPIRC Research Group 2003). Contrary to the general understanding, it appeared that the SSB actually made larger-scale upward adjustments in the second half of the 1990s than the early 1990s, when all demographers and policy makers considered the data seriously deteriorated. Table 5.5 also shows the comparison between the survey-observed total fertility and the SFPC officially adjusted total fertility. As can been seen, in the second half of the 1990s, the correction factors for total fertility were higher than the SSB factors for the CBR. It is not clear what the adjustment approach of the SFPC was, but it is likely to have overestimated the fertility.

Table 5.5 Implied correction factors for the unadjusted crude birth rate and total fertility rate from the annual surveys in China, 1991-2000

Year	Unadjusted CBR (per thousand)	Officially adjusted CBR (per thousand)	Implied correction factors for CBR (percent)	Unadjusted TFR	Officially adjusted TFR	Implied correction factors for total fertility (percent)
	(1)	(2)	(3)=100*(1-(1)/(2))	(4)	(5)	(6)=100*(1-(4)/(5))
1991	18.32	19.68	6.91	1.83	2.01	8.96
1992	16.35	18.24	10.36	1.69	1.84	8.15
1993	15.58	18.09	13.88	1.64	1.83	10.38
1994	15.32	17.70	13.45	1.60	1.81	11.60
1995	14.42	17.12	15.77	1.46	1.78	17.98
1996	14.32	16.98	15.67	1.55	1.81	14.36
1997	13.47	16.57	18.71	1.49	1.82	18.13
1998	13.28	15.64	15.09	1.50	1.82	17.58
1999	12.70	14.64	13.25	1.47	1.80	18.33
2000	11.40	14.03	18.75	1.22	1.80	32.22

Sources: The unadjusted CBR series are from CPIRC report (2003), 2000 from the census; the official adjusted CBR series from the SSB (2002a); the unadjusted TFR series from the SSB (1991-2002); 1991-1993 from Sun and Hu (1993); the officially adjusted TFR series from the SFPC (2001).

Because of the problematic features of the 2000 census, it is difficult to determine the completeness of annual surveys in the 1990s. Comparison with the census enumerations suggested that the survey-estimated number of births exceeded 38.5 million than those estimated from the 2000 census using the reverse-survival method, implying that the 2000 census undercounted nearly 20 percent of young cohorts. Many authors used this as evidence to suspect serious undercounts of young children in the 2000 census (e.g. Goodkind 2004; Zhang and Cui 2003). But this argument is greatly weakened by the fact that the SSB intentionally inflated the estimation of the annual number of births. An alternative and more reasonable explanation is that the SSB overinflation was not supported by the census results. It is better to resort to other independent sources. As shown in Table 4.4 in Chapter 4, the cohorts born from 1991 to 1996 numbered 119.03 million from the school enrolment statistics, while the official survey-estimated births numbered 127.37 million, implying a 7 percent over-estimation of the SSB adjustment. According to column (3) in Table 5.5, the average of the SSB correction factors was 12.67 percent during the period from 1991 to 1996. Accordingly, the number of births directly estimated from the unadjusted SSB surveys during this period can be estimated as about 112.2 million.

Assuming that the education statistics are reliable, the estimated underreporting rate in the SSB surveys from 1991 to 1996 was about 9.3 percent (=112.16/119.03). Consequently, it can be reasonably assumed that even if the 'true' extent of underreporting in the SSB surveys during this period was not as low as the 6-7 percent as detected from the post-enumeration surveys in 1993-94, it is very likely that it did not exceed 10 percent.

In general, there are favourable conditions for the SSB surveys to have more complete reporting of births than other sources; but the surveys in the 1980s were suspected of serious underreporting of births. However, the large-scale shortfall in the survey-estimated number of births resulted not from the underreporting of births alone, but rather from the many shortcomings in the survey procedures. Once these problems were clearly addressed in the 1990s, the survey quality seemed to improve. More importantly, the more intensive post-enumeration survey was very helpful in quantifying the extent of underreporting. With this information, it is probable that the annual survey could basically reflect the actual fertility levels.

5.3 Data collection of the SFPC retrospective surveys

In addition to the routine family planning statistics, the SFPC organised quinquennial retrospective surveys in 1982, 1988, 1992, 1997 and 2001. These surveys provide in-depth histories of marriage, fertility, and contraception of women of reproductive age, which are valuable in understanding patterns, levels and trends of fertility over the past several decades.

The first two surveys conducted in 1982 and 1988 had huge sample sizes and plenty of fertility information. They are still the most important demographic data for understanding fertility changes in the past half-century. The 1982 one-per-thousand survey covered one million people and obtained detailed lifetime fertility histories of 310, 000 women from 15 to 67 years of age. The 1988 survey two-per-thousand survey covered 2 million persons and obtained detailed pregnancy, fertility and contraceptive histories of 459, 000 women aged 15-57 in 1988. These two surveys allowed direct calculations of accurate marriage and fertility rates and other primary

demographic rates from 1950 until 1987. The careful design and excellent performance of these two surveys were well received by demographers internationally (e.g. Caldwell and Srinivasan 1984; Coale 1984; Coale and Banister 1994; Duan 1985; Feeney and Wang 1993; Lin and Wang 1991). Nevertheless, these surveys were found to have some underreporting of births, in particular of females in the 1988 survey. For example, one analysis estimated that the 1988 survey may have underreported births by 5 percent from 1983 to 1987 (Zeng et al. 1993).

In the 1990s, the focus of the SFPC survey contents shifted from fertility alone to broader topics. This was particularly the case when the SFPC began the re-orientation of the program in the mid-1990s. For example, the 1997 survey and the more recent 2001 survey devoted most of their efforts in reproductive health issues, although they also enquired detailed marriage and pregnancy histories of women of reproductive age. At the same time, the survey design, the sample size, and the data gathering approach all experienced some modifications. Besides underreporting of births, some changes in design and data collection operations also contributed to difficulties in fertility analysis.

The 1992 survey was a stratified two-stage cluster systematic sample survey organised in October 1992. With each province treated as a stratum, one of every four county-level units was sampled in the first stage. Among those selected county-level units, one in every 1, 000 villages and resident groups was sampled at the second stage. The survey included every household in selected rural villages and urban resident groups, covering 385, 471 persons. Subsequently, 107, 213 women aged 15-49 at the time of the survey within the selected households were interviewed about their marriage and partial birth histories, up to four births. The reported sampling errors of CBR, GFR and TFR were below 2 percent for the total population (Hao and Gao 1996: 140-141). However, given the observed very low fertility, 1.65 in 1991 and 1.52 in 1992, this survey was highly suspect for underreporting of births, which directly resulted in the long-lasting fertility debate.

Both the 1997 and 2001 surveys used the stratified, three-stage cluster and proportional probability sampling approach and roughly the same sampling frame. First, in each stratum at the provincial level, one of every eight county-level units

was sampled. Second, in each sampled county-level unit, 3-4 township-level units were selected. Third, one village group or resident group of sampled township units was sampled. Around 1, 000 such groups throughout the country were randomly chosen, covering about 180, 000 persons in sample households. The reported sampling error of crude birth rate was 4 percent within the 95 percent confidence interval at the national level in the 1997 survey. According to the SFPC, the 1997 survey was designed to be representative at the national level and for the three large regions, namely, the east, middle and west regions (Wang and Wang 2000). This implied that any subnational analysis would encounter greater sampling variation.

In the 1997 survey, using all the women of reproductive age in sample households as a new sampling frame, each province sampled women aged 15-49 based on the proportion of women in the province to those in the whole country. As a result, 15, 213 women, 95 percent of the sampled 176, 090 people, were interviewed about their lifetime pregnancy histories. In the 2001 survey, every woman of reproductive age in sampled households was interviewed. The sample size at household level was 177, 610 persons in all provinces in the mainland of China. Then 39, 586 women, 98.3 percent of the 40, 282 women aged 15-49 in September 2001 were interviewed. Compared to the 1997 survey, the enlarged sample size means a reduced degree of sampling variation.

5.4 Underreporting of births in the 1992, 1997 and 2001 surveys

Both the SSB annual surveys and SFPC retrospective surveys suffer from some underreporting of out-of-plan births, which occurred close to the survey time. However, compared to the annual survey, the retrospective survey is expected to be more useful in revealing underreporting of births in earlier years, after their status had become less sensitive.

5.4.1 Problematic features of the controversial 1992 survey

As discussed in Chapter 1, all the controversy over fertility in the 1990s can be traced back to the 1992 survey. It is important to stress in this thesis that several

unique features of the survey resulted in its serious underreporting, as suggested by Zeng (1996). More importantly, many problems of this survey had been intentionally avoided by the SFPC in conducting the following 1997 and 2001 surveys. In these circumstances it could not be simply concluded that all retrospective surveys suffered to the same or a similar degree of the underreporting of births.

In the early 1990s the SFPC had been quite clear that statistical manipulation and falsification came mainly from the program workers at the township and village level. Nonetheless, they still left the local program workers to decide the ultimate sampling units and recruited them as survey interviewers partly because of inadequate funding, and partly because of their familiarity with local conditions (Chen 1996). Accordingly, the data were manipulated not only by underreporting of births from respondents, but more importantly, by the replacement of sampled backward areas by areas with better performance, as was shown by published survey data (Scharping 2003). The most serious damage to the survey was the SFPC recruitment of local program workers in sampled areas as the interviewers. It was expected that these local cadres could obtain more accurate and reliable information from their clients (Chen 1996: 325-330); but this decision actually put the sample survey in the same boat as the routine statistics.

The wording of the survey questions and the arrangement of the contents also contributed to its questionable quality. The survey had a quite simple one-page questionnaire with 16 questions. Among these questions, only two questions enquired about women's birth histories, which asked respondents for the number of births, and the years of occurrence of the last four births, classified by 'in-plan' or 'out-of-plan'. It was asserted that these simple questions made it possible and easy to underreport births, or misreport newborns as previous births. In addition, the classification of in-plan and out-of-plan made things even more complicated. As one later study concluded, the questionable survey design was likely to cause enumerators 'to hint, or even to instruct the respondents to tell lies, or change the answers that they had already given relating to recent births' (Zeng 1996: 28).

It has been widely agreed that the completeness of reporting of births in the 1992 survey was highly suspect, but there has been no agreement on the exact extent. The

SFPC estimation was 13 percent underreporting of births in 1991-92 (Jiang, Zhang and Chen 1995: 869-870), similar to the estimation between 10 percent and 20 percent proposed by Feeney and Yuan (1994: 381). Zeng (1996: 27) was more pessimistic and believed it more likely that births were underreported by 25-28 percent in 1991 and 1992. The latter conclusion has been widely accepted and referred to among demographers and policy makers since the mid-1990s (see Greenhalgh 2003; Yu and Xie 2000; Zhang 1995). However, as time goes on and more evidence becomes available, the latter estimation appeared to be an over-estimation. As shown in Chapter 3, neither the official estimates after upward adjustment, nor the estimates based on the recent 2000 census reported such a high number of births. Moreover, as shall be discussed later, the following 1997 and 2001 surveys reveal some extent of underreporting of births, but also show many consistencies between them. Hindsight suggests that perhaps Feeney and Yuan's estimation of underreporting of births by 10-20 percent was closer to reality, given the practical problems in carrying out the 1992 survey.

5.4.2 Underreporting of births in the 1997 and 2001 surveys

Learning from the 1992 survey, the SFPC made many changes in the data collection operations in the 1997 and 2001 surveys. First, both sample sizes were greatly reduced to cover about 18, 000 people in sampled households, which was representative at the national level and large regional levels. This measure aimed to reduce the concerns of family planning commissions below the provincial level, and more importantly, the concerns from local program workers in sampled areas. Second, the SFPC decided that all ultimate sample units must be selected at the central level and forbade any replacement at the basic level; if such a replacement was really necessary, SFPC approval must be obtained in advance. After the completion of the first-stage household survey, all demographic information of sampled women was put into the SFPC computer. All sampled women at the second-stage were randomly selected by the SFPC. This measure enabled the SFPC to inspect the information on a specific woman in the post-enumeration survey, if it was necessary. Third, the SFPC required that enumerators must be chosen from county family planning commissions, avoiding any interference from the township and

village cadres. Besides, they required all questionnaires to be sent directly to the SFPC by prepaid courier mail at the township post office shortly after the household interviews, preventing any aggregation at higher levels and hence potential manipulation or falsification.

There were also changes in the survey contents. The 1992 survey has only two simple questions related to fertility, which lack a logical relationship to support each other. In the 1997 and 2001 surveys, the designers purposely avoided repeating this problem. Both surveys asked women about their pregnancy histories, incorporating the questions on pregnancy dates and results, the delivery location, the period of lactation and the contraceptives used before and after the pregnancy. This approach made underreporting or misreporting more difficult, because the respondents must ensure that their answers were logical if they really underreported births or misreported either birth order or birth date. Other questions concerning abortion and contraception also have a logical relationship with the questions in pregnancy histories.

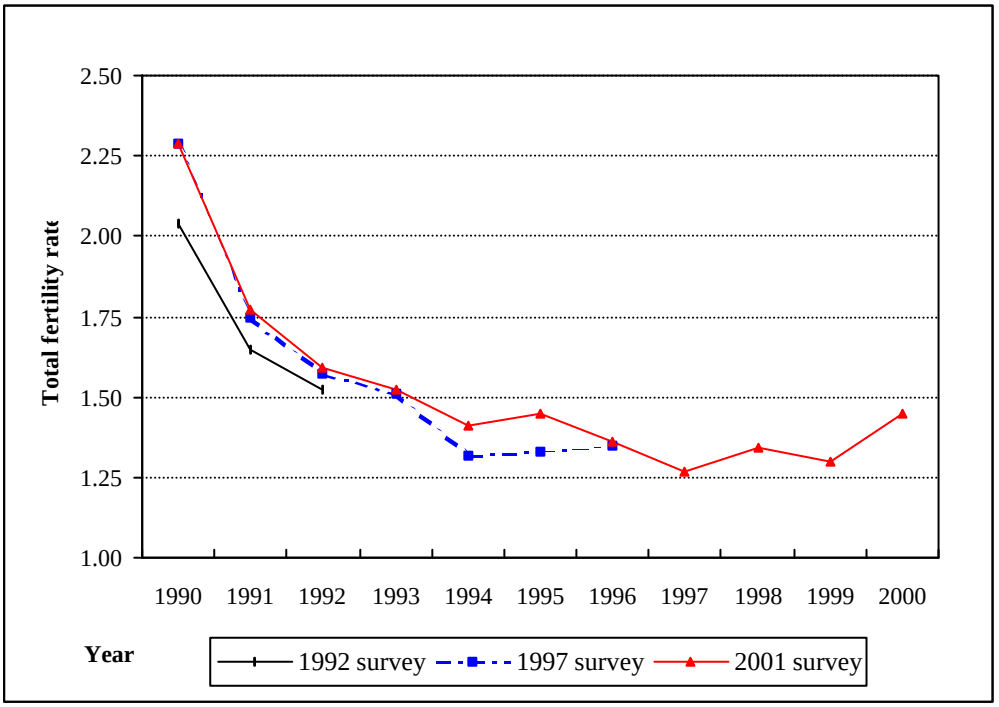
After the completion of the 1997 survey, the SFPC recruited its own staff and some provincial statisticians went to villages directly to check the survey quality. The post-enumeration survey reported that 6.47 percent of births from 1991 to the time point of survey were unreported. Nonetheless, if the pre-1991 period was taken into account, a larger proportion of CEB seemed to be unreported, about 7.99 percent (Wang 2000b: 419-420). After the 2001 survey, a similar post-enumeration survey was also conducted, but the result is not yet available.

5.4.3 Consistencies and discrepancies between the three surveys

Figure 5.1 presents the time series of total fertility estimated from the 1992, 1997 and 2001 surveys. Because all these surveys dealt with women aged 15-49 at the time of survey, fertility rates in the latter two are truncated at age 35. As can be seen, the fertility series estimated from the 1997 and 2001 surveys are quite consistent before 1994, three years before the 1997 survey. However, both surveys reported higher fertility than the 1992 survey during the years 1990-92. It is important to note that all the three surveys agreed with each other in reporting a similar declining trend of

fertility from 1990 with a sudden drop between 1990 and 1991. It appeared most underreporting occurred in the period closer to the survey time. This is consistent with many authors' findings about surveys in the 1980s, which suggested that births close to the survey were more sensitive to punishment and were more likely to go unreported (Guo 2000b; Zeng 1996). By the same token, the 2001 survey itself would not be immune to underreporting; the low fertility rates in 1997 and 1999 probably were signs of underreporting of births in these two years.

Figure 5.1 Comparison of total fertility rates estimated from the 1992, 1997 and 2001 surveys in China, 1990-2000.



Source: Own calculations based on the 1992, 1997 and 2001 surveys.

In general, the later surveys reported a slightly higher fertility at the same point of time than previous ones. With an assumption that the later surveys are a little more reliable, this comparison could reveal underreporting of births in the previous two surveys, but only moderately. For example, compared to the 2001 survey, the 1992 survey underreported births by 11 percent in 1990, 6.8percent in 1991 and 4.4percent in 1992. Similarly, the 2001 survey suggested that the 1997 survey underreported births by 6.4 percent in 1994 and 8.3 percent in 1995. This was consistent with the findings of the post-enumeration survey for the 1997 survey.

Table 5.6 compares the mean CEB numbers for women aged 15-49 in 1992 in the four consecutive surveys in 1988, 1992, 1997 and 2001. This comparison did not consider the mortality factor, as its primary purpose was to find out whether the 1992 survey seriously underreported births. In general, the four surveys show a decline in fertility in the 1990s, with the mean CEB number among married women decreasing from 2.33 in 1988 to 1.72 in 2001 respectively. The comparison in the same cohorts aged 15-49 in 1992 suggested some extent of underreporting of births at certain age groups, such as women aged 30-39 in 1992, in the 1992 and 1997 surveys, and women aged 40-44 in the 1992 survey.

Table 5.6 Comparison of mean number of children ever born (CEB) by the same cohorts of women aged 15-49 in 1992 in SFPC surveys in China, 1988, 1992, 1997 and 2001

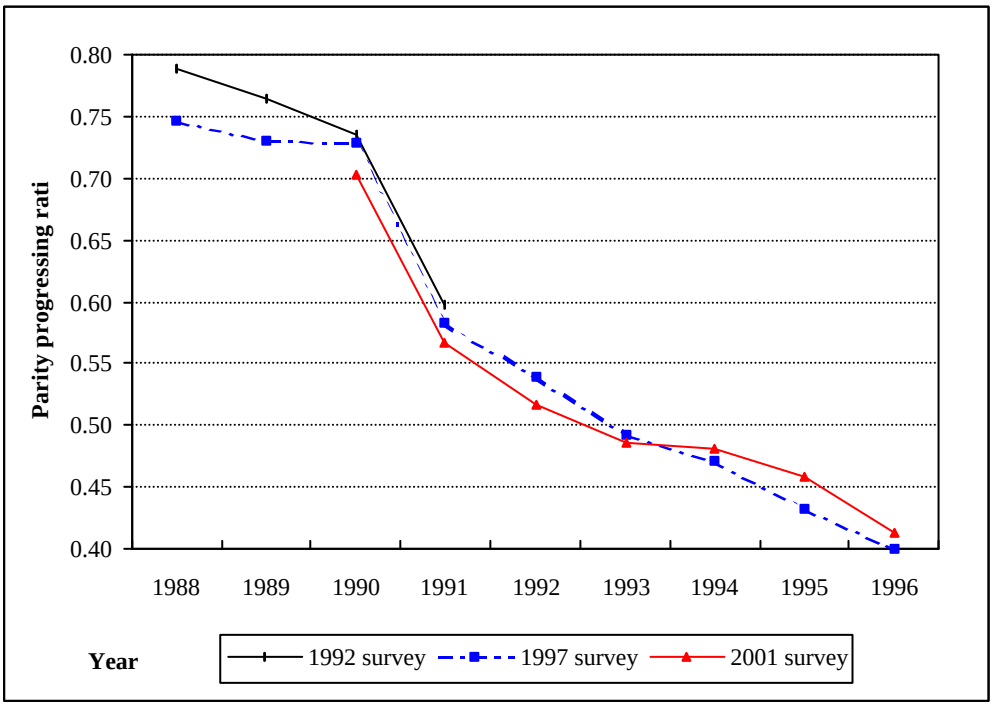
Age of cohort group in 1992	1988 Mean CEB	1992 Mean CEB	1997 Mean CEB	2001 Mean CEB
15-19	-	0.54	0.80	1.1
20-24	0.47	0.88	1.26	1.47
25-29	1.05	1.54	1.78	1.85
30-34	1.69	1.94	2.01	2.04
35-39	2.21	2.28	2.25	2.27
40-44	2.94	2.88	2.83	-
45-49	3.83	3.58	-	-
Mean CEB of married women (15-49)	2.33	2.04	1.86	1.72

Source: Own calculations based on the 1988, 1992, 1997 and 2001 surveys.

Since fertility and mean CEB can be affected by delayed marriage, the following analysis compares of parity progression ratios calculated from the 1992, 1997 and 2001 surveys. In China, most women will be married and have their first births, which was supported by a number of previous studies that reported the parity progression ratio from a woman's own birth to her first birth being close to one (see Feeney and Wang 1993; Feeney and Yu 1987; Feeney and Yuan 1994; Guo 2000b). The family planning policy permits certain couples to have a second birth but almost excludes a third birth. Therefore, the comparisons only consider the parity progression ratios from parity 1 to parity 2, and from parity 2 to parity 3.

Figure 5.2 presents the parity progression ratios from parity 1 to parity 2 calculated from the 1992, 1997 and 2001 surveys. For the period from 1988 to 1991 when comparisons were possible, there is no evidence indicating underreporting of births in the 1992 survey, but rather in the later two surveys. Given the fact that the later two surveys are a long time after the births, there is a possibility that higher-order births were misreported as first-order births in the 1992 survey. The comparison between the 1997 and 2001 surveys is a little complicated to interpret. The parity progression ratios in the 2001 survey were lower than those in the 1997 survey from 1990 to 1993, but higher from 1994 to 1996. Since the 2001 survey was more distant from the comparison period, it is possible that respondents in the 1997 survey misreported births in recent years as births in earlier years. In addition, it is also possible that respondents in the 1997 survey reported fewer second births during the period from 1994 to 1996, closer to the survey time.

Figure 5.2 Comparison of parity progression ratios from parity 1 to parity 2, calculated from the 1992, 1997 and 2001 surveys in China, 1988-1996

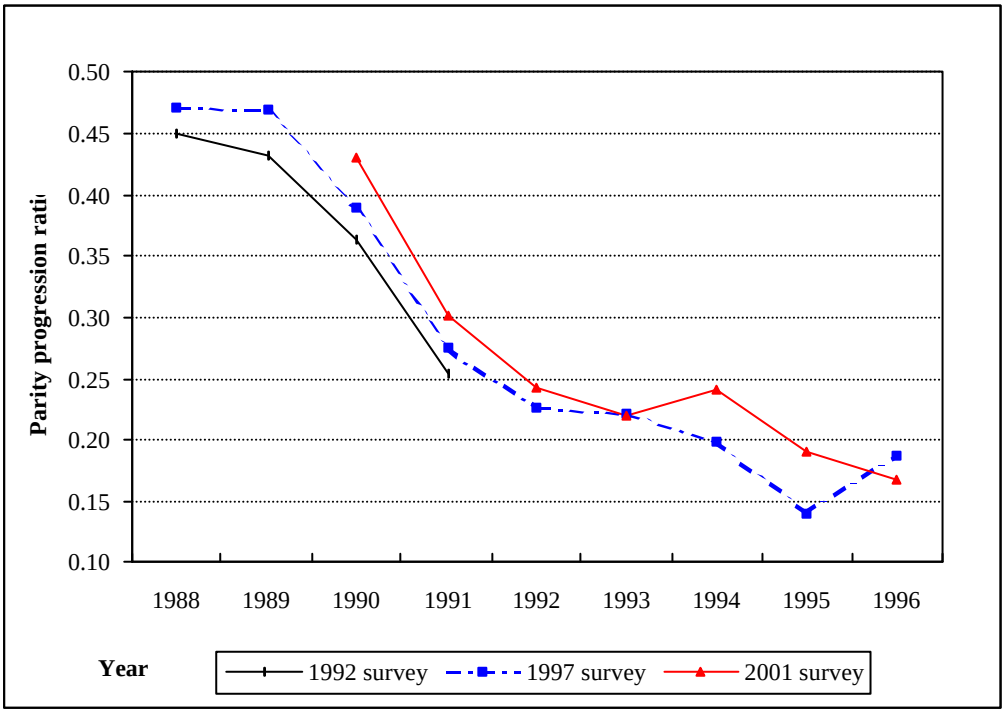


Source: Own calculations based on the 1992, 1997 and 2001 surveys.

Figure 5.3 further compares the parity progression ratios from parity 2 to parity 3. From 1988 to 1991, the later two surveys reported higher progression ratios in each

year. This indicates that the 1992 survey mainly underreported higher-order births, probably through misreporting higher order births as first or second-order births. This supports the interpretation in the preceding paragraph. From 1990 to 1995, the 2001 survey reported a higher proportion of women who had third-order births than the 1997 survey in every year. Underreporting of higher-order births, or misreporting of higher-order births as second-order births, and misreporting of current births as earlier births probably existed together.

Figure 5.3 Comparison of parity progression ratios from parity 2 to parity 3, calculated from the 1992, 1997 and 2001 surveys in China, 1988-1996



Source: Own calculations based on the 1992, 1997 and 2001 surveys.

The above comparison suggests that all the three most recent SFPC surveys suffered from underreporting of births, but not on a large scale, such as by 25-28 percent argued by some authors. It is important to recognise that the more serious underreporting in the 1992 survey was closely associated with its problems in data collection operations, which were largely avoided in the later 1997 and 2001 surveys.

5.5 Differentiating patterns of birth underreporting between annual surveys and 2001 survey

This section examines the differing patterns of underreporting through comparison between annual surveys from 1991 to 2000 and the 2001 retrospective survey. It is expected that the comparison between these two different sources can reveal systematic discrepancies in birth reporting, because they are organised by two government agencies, using different approaches of data collection at different points of time. Such discrepancies will offer further evidence to estimate the extent of underreporting of births, and clues to fertility estimation.

Table 5.7 presents the comparison of age-specific fertility rates (ASFR) by 5-year age group between the two sources. The comparison is limited to women aged below 35, because the 2001 survey only interviewed women aged 15-49. As can be seen, the annual series generally reported slightly higher fertility rates than the 2001 survey, particularly in the second half of the 1990s. The exception is in the census years of 1995 and 2000, when the 2001 survey seemed to have more complete reporting of births. This was probably because the sample census and census long form have larger sample sizes and involve more enumerators and respondents, and hence have more underreporting of births. Nonetheless, there was very close agreement in the trends of fertility decline. When the fertility rate of each 5-year age group is examined, in the younger age group of 15-19 in most years, as well as in the age group of 20-24 in some years, the 2001 survey reported more births than the 'current status' annual survey. It makes sense that some women with early childbearing omitted or misreported their births or their ages in the annual survey, but reported them retrospectively when the issue had become less sensitive in later years. This would inflate the reported mean age at first birth (MAB_1) in annual surveys, as illustrated in the following analysis.

Table 5.7 Comparison of truncated age-specific fertility rates (ASFRs) between annual surveys and 2001 survey in China, 1991-2000

Year	Source	Age group				Total
		15-19	20-24	25-29	30-34	
1991	SSB 1991	0.0089	0.1712	0.1236	0.0414	1.73
	SFPC 2001	0.0248	0.1800	0.1018	0.0360	1.71
1992	SSB 1992	0.0074	0.1600	0.1114	0.0406	1.60
	SFPC 2001	0.0184	0.1592	0.0962	0.0346	1.54
1993	SSB 1993	0.0077	0.1525	0.1166	0.0370	1.57
	SFPC 2001	0.0178	0.1554	0.0924	0.0226	1.44
1994	SSB 1994	0.0045	0.1389	0.1238	0.0405	1.54
	SFPC 2001	0.0148	0.1430	0.0904	0.0258	1.37
1995	SSB 1995	0.0109	0.1541	0.0918	0.0265	1.42
	SFPC 2001	0.0138	0.1498	0.0916	0.0280	1.42
1996	SSB 1996	0.0073	0.1515	0.1095	0.0314	1.50
	SFPC 2001	0.0120	0.1418	0.0862	0.0254	1.33
1997	SSB 1997	0.0027	0.1293	0.1218	0.0349	1.44
	SFPC 2001	0.0080	0.1260	0.0826	0.0266	1.22
1998	SSB 1998	0.0026	0.1267	0.1193	0.0376	1.43
	SFPC 2001	0.0096	0.1394	0.0882	0.0262	1.32
1999	SSB 1999	0.0026	0.1220	0.1188	0.0400	1.42
	SFPC 2001	0.0084	0.1312	0.0850	0.0282	1.26
2000	SSB 2000	0.0060	0.1145	0.0870	0.0286	1.18
	SFPC 2001	0.0080	0.1470	0.0994	0.0296	1.42

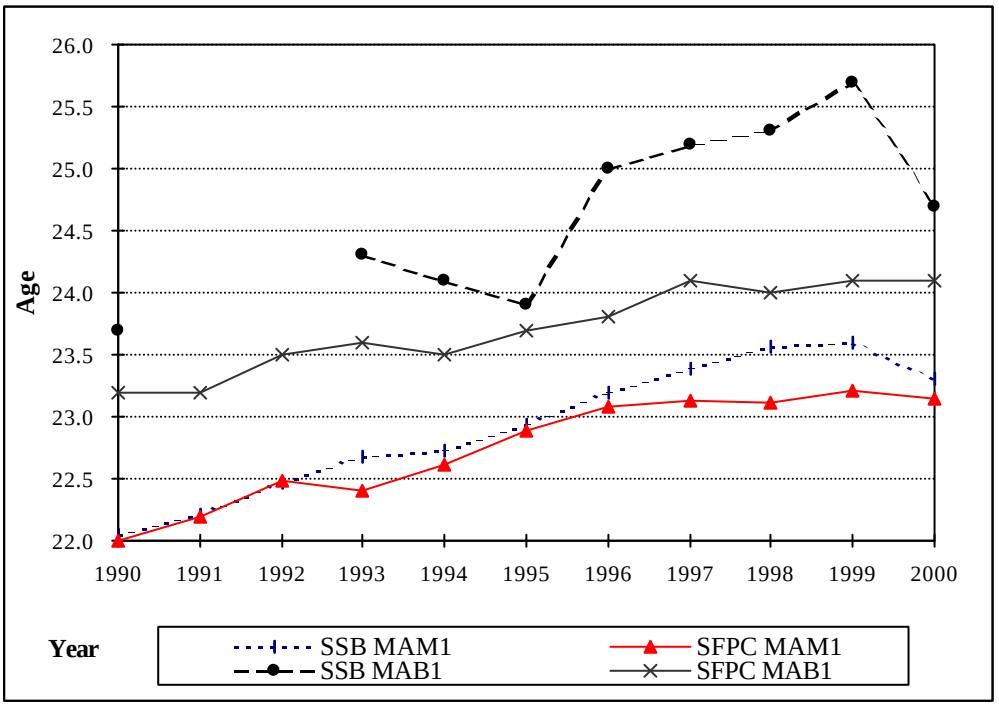
Sources: The SSB series are from the SSB (1991-2002); the SFPC series are own calculations based on the 2001 survey.

Note: The SSB 1995 source is 1995 sample census, and the SSB 2000 is the census long form.

Curiously, the 2001 survey recorded fewer births than the annual series in the two older age groups of 25-29 and 30-34. There are two possible explanations for such differences: first, the 2001 survey failed to reveal some hidden births, which were normally higher-order births and to women in their late twenties or early thirties; second, annual surveys recorded some higher-order out-of-plan births but misreported in birth orders, for example, second or even higher-order births were reported as first-order births. It seems that both explanations are reasonable given the impact of the family planning program on demographic measurement. But in the second explanation, many second or higher-order out-of-plan births appeared in

annual surveys. This pattern of reporting of births implied the concealment of previous births, but did not necessarily affect the completeness of the current survey. Since the annual survey revolved samples every year, it was possible for some women, or even some enumerators, to misreport higher-order births as first or second-order births. This misreporting would also inflate the mean age at first birth and can be identified by examining the mean age at first marriage and first birth, as well as first-order fertility rates. On the other hand, because the retrospective survey is based on a single sample of women aged 15-49, the underreporting of births would affect all calculations for estimating fertility retrospectively.

Figure 5.4 Mean age at first marriage (MAM1) and at first birth (MAB1) in annual surveys and the 2001 survey in China, 1990-2000



Sources: The SSB series are own calculations based on data from the SSB (1991-2002); the SFPC series are own calculations based on the 2001 survey.

Note: The data of mean age at first birth in 1991-92 are not available.

Figure 5.4 presents the mean age at first marriage and at first birth in both sources. Both surveys reported an increasing trend of mean age at first marriage and at first birth. However, the annual surveys reported a higher marriage age than the SFPC survey. Moreover, they reported higher age at first birth, especially the four surveys conducted from 1996 to 1999. For example, the reported mean age at first marriage

was 23.6 and at first birth was 25.9 in 1999, much higher than those reported in the 2001 survey. Given the reported lower ASFRs in younger age groups and higher ASFRs in older age groups in annual surveys compared to the 2001 survey, there was likely inflation in the mean age at first marriage and at first birth in the annual surveys. However, this can only be proved after taking into account the analyses of first-order fertility rates in annual surveys.

Given the parity-specific features of the family planning program, first-order births are less likely than second and higher-order births to be unreported. The major exception was first-order births to women who were married and had first births before the minimum legal age of 20, but this will not be a big proportion of all births, about 2-7 percent in the 1990s. Certainly, both the misreporting of birth orders and the misreporting of age at childbearing can distort the first-order fertility rates. As shown in Figure 5.4, both annual surveys and the 2001 survey have a loose agreement in the rising age of first marriage and first births. The TFR for first births must logically be lower than 1. Moreover, in the Chinese context, marriage for women after 23 has been 'late' marriage and their births are certainly 'late' births. There is no reason why many women would want to inflate their age at first birth. Therefore, the misreporting of birth orders by older women is more likely to occur than the misreporting of age at childbearing by younger women except when they were very young.

Table 5.8 shows total fertility rates for first-order births in two sources. The declining trend of total fertility rates for first-order births in the 2001 survey is consistent with the increasing trend in the mean age at first marriage and first birth. However, the TFR of first-order births exceeded 1 in annual surveys from 1996 to 1999. This undoubtedly contradicts the trend toward increasingly later ages at marriage and first birth as reported in the same source. It could be the outcome of misreporting ages at birth by women with early childbearing, but the fertility rates of women aged 15-19 were very much lower than those of women aged 20-24, and thus the misreporting of women 15-19 year old as 20-24 might not affect the fertility rate very much (see Table 5.7). A more reasonable explanation is that some women misreported their higher-order births as first-order births, concealing their previous births.

Table 5.8 Total fertility rates for first-order births in annual surveys and 2001 survey in China, 1990-2000

Year	Annual surveys	2001 survey
1990	1.056	1.038
1991	n.a.	0.903
1992	n.a.	0.871
1993	n.a.	0.887
1994	0.946	0.834
1995	0.959	0.915
1996	1.059	0.882
1997	1.043	0.842
1998	1.045	0.880
1999	1.080	0.873
2000	0.871	1.014

Sources: The SSB annual series are own calculations based on unadjusted data from the SSB (1991-2002); the SFPC series are own calculations based on the 2001 survey.

Table 5.9 Percentage distribution of births by birth order in annual surveys and the 2001 survey, 1990-2000

Year	Annual surveys			2001 survey		
	1st births	2nd births	3rd births	1st births	2nd births	3rd births
1990	52.0	31.5	16.5	50.0	32.4	17.6
1991	n.a	n.a	n.a	54.6	30.2	15.2
1992	n.a.	n.a.	n.a.	57.6	28.9	13.5
1993	61.3	27.5	11.2	61.5	29.7	8.8
1994	62.8	27.8	9.5	59.5	28.8	11.7
1995	67.0	25.6	7.4	62.4	27.4	10.4
1996	67.9	25.6	6.6	63.2	27.7	9.0
1997	70.9	24.0	5.1	63.7	28.5	7.8
1998	70.3	25.0	4.7	62.5	30.9	6.6
1999	72.7	26.7	4.5	63.5	28.5	8.0
2000	68.0	26.1	5.9	65.8	29.8	4.4

Sources: The SSB series are own calculations based on unadjusted data from the SSB (1991-2002); the SFPC series are own calculations based on the 2001 survey.

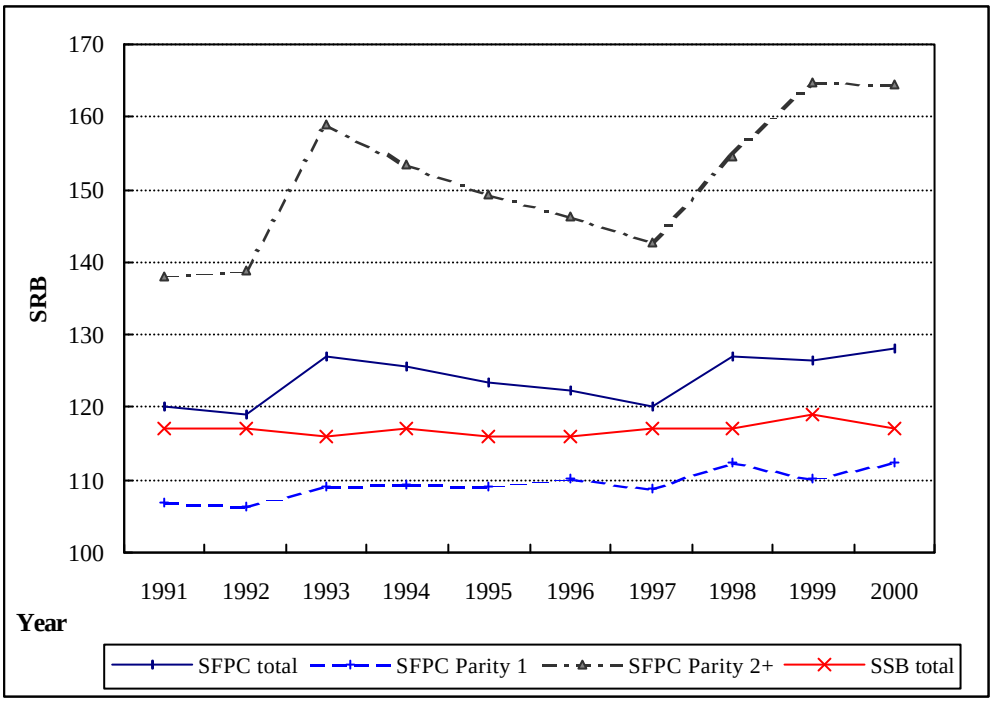
This is further supported by the distribution of births by birth order in two different sources. As shown in Table 5.9, annual surveys reported a higher proportion of first-

order births than in the 2001 retrospective survey. This presents evidence of the inflation of first-order births, mostly misreporting higher-order births, in annual surveys. As both the SSB and the SFPC endlessly stressed the importance of revealing concealed births after 1993, the pattern of underreporting of births seems very likely to have been a reasonable choice for many respondents or even local cadres, if they were involved in the enumerations.

Another measure to detect underreporting of births is to examine the reported sex ratio at birth (SRB). Figure 5.5 gives SRB figures observed in the two sources, which both reported an abnormally high SRB each year. The SRB figures from the 2001 survey are also given by parity, but unfortunately no similar information is available from annual surveys. The annual survey reported an abnormal but roughly stable sex ratio at birth, around 117 over the decade (SSB 1991-2002). The 2001 survey reported more skewed but fluctuating figures from year to year, on average 123 from 1991 to 1995 and 126 from 1996 to 2000. Since both surveys suffered from underreporting of births, the abnormally high SRB in both sources may signal their underreporting of female births.

In the 2001 survey, the SRB for parity 1 was roughly stable around 110 over the decade, but those for parity 2 and above fluctuated and were strikingly high. This could arise from the smaller sample size through which some ‘missing’ births could cause huge differences in SRB figures, which appeared even more obvious in the urban population. But given the highly skewed SRBs reported in the retrospective survey, this very likely indicates underreporting of second and higher-order births, and probably most female births, in the 2001 survey. On the other hand, many higher order births, and probably more female births, appeared in the annual surveys misreported as first or second-order births. This explains why the SSB annual surveys actually estimated higher fertility rates than the 2001 survey.

Figure 5.5 Sex ratio at birth (SRB) in annual surveys and the 2001 survey in China, 1991-2000



Sources: The SSB series are from the SSB (1991-2002); the SFPC series are own calculations based on the 2001 survey.

Note: Due to small number of higher-order births, the SRBs for second-order and above births are combined together.

In general, the data comparison between the SSB and SFPC surveys suggests that both of them suffered from underreporting of births, but with meaningfully different patterns and extents. As a current status enquiry, the annual survey suffered from both underreporting of earlier births in younger age groups, and higher-order out-of-plan births. However, all relevant evidence proves that many higher-order births appeared in annual surveys through being misreported as first-order births, indicating that the extent of underreporting of births was probably not as serious as generally believed. On the other hand, the 2001 survey is reliable in reporting events which were sensitive issues years before, such as early marriage and early childbearing. However, like annual surveys it also suffered from underreporting of out-of-plan births which occurred close to the survey time. Moreover, the 2001 survey inclusion of only one group of women of reproductive age made it more easily affected by underreporting of second and higher-order births, which was supported by the evidence of lower fertility rates in the older age groups of 25-34, and the highly skewed SRBs at parity 2 and above.

5.6 Conclusion

This chapter reviews the data collection operations and problems, and underreporting of births in the SSB annual surveys and the SFPC retrospective surveys. Like the population census, both surveys collected information directly from respondents, largely avoiding intermediate interference. Moreover, because surveys cover much less of the population, and involve much fewer trained enumerators, they are expected to be of a better quality than the population census.

It was generally believed that the annual surveys underreported births by a large margin in the 1980s. But this analysis shows that the simple comparison between the survey-estimated number of births and those estimated from the 1990 census did not take into account the shortage of base population from the weakened *hukou* statistics. In contrast, a more careful comparison of fertility estimates from two sources shows that the incompleteness of annual surveys may not be so serious. During the 1990s, partly because of the experiences of underreporting in the 1980s, and partly because of the observed very low fertility, the SSB made a large-sale upward adjustment in estimated birth rates and number of births during the 1990s. The comparison with other independent sources in this analysis challenges the SSB overestimation, suggesting less than 10 percent underreporting of births. The findings, about 6-7 percent underreporting of births, from the post-enumeration surveys should be respected. Again, no strong evidence has been found to support claims that the annual surveys were worse in the 1990s than in the 1980s.

The problematic features of the 1992 survey resulted in its serious underreporting of births, and further affected the general comments on the SFPC surveys. However, this analysis suggests that the previous estimation of underreporting of births by 25-28 percent very likely overestimated the problem. The comparison with the more recent 1997 and 2001 surveys shows many consistencies between them. Although the later surveys revealed underreporting of births in previous ones, the estimated extent was not as serious as generally believed. This analysis further compares the systematic differences in the patterns of underreporting of births between annual surveys and the 2001 survey. Although the retrospective survey is supposed to be

more powerful in revealing previous underreporting of births, the practice of misreporting of higher-order births as first births resulted in the age-specific fertility rates observed in the annual surveys being higher than those from the retrospective survey. This implies that annual surveys have included more ‘out-of-plan’ births than the retrospective survey.

Chapter 6 Reconstruction of the Path to Far Below Replacement Level Fertility

Detailed examination of each data source has shown widespread underreporting of births, but the widely accepted argument that the extent of underreporting was more serious is challenged in the 1990s than in the 1980s, except for the 2000 census. This leads to two conclusions: (1) not all out-of-plan births went unreported, as many of them would show up in different sources at the same time or in the same source in later years; and (2) not all sources of data suffer from the same extent of underreporting, while surveys and censuses generally have more complete birth reporting than the registration-based statistics.

The most important implication of the above findings is that the chances of consistent underreporting of births both across sources of data and over time are very low. If later surveys and censuses failed to reveal substantial underreporting of births in previous ones, it is more likely that the 'missing' births never occurred than that they were concealed in statistics. This offers a sound basis to reconstruct the levels and trends of fertility in the 1990s, using surveys and censuses after adjusting for the later 'newfound' children omitted from preceding investigations. However, given the data limitations, it is nearly impossible to estimate the precise extent of birth underreporting and hence accurately estimate true fertility levels. Because this study has estimated the extent of underreporting of births in data used only after evaluating their specific problems from the available evidence, it is most likely an improvement over the corrections based on misunderstandings of data sources or mistaken assumptions on the extent of underreporting.

According to many Chinese demographers in the 1990s, once fertility reached replacement level, it was hard for it to decline further. In addition, they often referred to the low level of socio-economic development in China to justify the rejection of the very low fertility observed in surveys and census (e.g. Yu and Xie 2000; Zeng 1996; Zhang 1997). But, the experience of both developed and developing countries demonstrated that fertility did not stall at replacement level, but went far below that

level (Bulatao and Casterline 2001). Some developing countries with moderate socio-economic development also experienced rapid fertility decline and went below replacement level (United Nations 2003). It is of interest to put China's fertility decline in international perspective.

The first four sections of this chapter focus on reconstruction of the levels and trends of fertility in the 1990s, while the final three deal with the underlying mechanisms of fertility decline. Section 6.1 introduces the efforts made by demographers to estimate fertility, and their limitations. Section 6.2 evaluates the roles of various sources of data in fertility estimation, Section 6.3 estimates the extent of birth underreporting in the annual surveys, and Section 6.4 further estimates the fertility levels and annual births during the 1990s. Section 6.5 introduces the direct programmatic and demographic bases for further fertility decline, Section 6.6 explores the underlying mechanisms resulting in the rapid decline of fertility, and Section 6.7 puts China's fertility decline in international perspective. Section 6.8 presents the chapter summary and conclusion.

6.1 Speculations about 'true' fertility levels over the decade

Although a consensus was reached on the deterioration in data quality and the necessity of upward adjustment for fertility, there was controversy over fertility levels during the 1990s among demographers and policy-makers. Since the mid-1990s, many speculations and proposals have been proposed to estimate 'true' fertility levels. Most of these estimates similarly tended to reject the low fertility figures at their face value, and adjusted fertility at a higher level. For example, the total fertility for 1991 reported from the 1992 survey was 1.65, but the estimates varied from 1.91 to 2.20. The total fertility for 1995 calculated from the 1995 sample census was 1.46, but the official estimate was as high as 1.85 (Zhang, Yu and Cui 1997). While the 2000 census reported a total fertility as low as 1.22, almost all studies rejected this with estimates ranging from 1.58 to 1.80 (Retherford et al. 2004; Yu and Wang 2004). Based on the data used and demographic techniques employed, these estimates can be roughly collapsed into three categories. Table 6.1 presents selected efforts at fertility estimation at different points in time.

Table 6.1 Selected speculations on 'true' fertility levels after upward adjustment in China, 1990-2000

Year	Zeng (1996)	Zhang (1997& 2003)	Qiao (1999)	Attane (2001)	SFPC adjusted (2001)	CPIRC (2003)	Yuan et al. (2003)	Goodkind (2004)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1991	2.20		2.16	2.24	2.01	2.14	1.91	2.00
1992	2.10		2.00	2.05	1.84	1.86	1.80	1.82
1993			1.98	2.05	1.83	1.80	1.72	1.81
1994			1.94	2.04	1.81	1.79	1.62	1.79
1995		1.85	1.87	1.99	1.78	1.78	1.69	1.77
1996			1.86	2.01	1.81	1.78	1.58	1.80
1997			1.82	1.99	1.82	1.82	1.55	1.82
1998			1.76	1.99	1.82	1.83	1.63	1.79
1999					1.80	1.75	1.57	1.74
2000		1.80			1.80	1.80	1.63	1.70

Sources: The SFPC adjusted series are from the SFPC (2001); other series are from various sources (Attane 2001; CPIRC Research Group 2003; Goodkind 2004; Qiao 1998; Yuan et al. 2003; Zeng 1996; Zhang 1997).

The first approach is based on the 1992 survey (column 1 in Table 6.1), but draws heavily on knowledge of the underreporting problem in the family planning statistics. The assumption in this adjustment was that the detected extent of birth underreporting in local family planning statistics in rural areas would represent rural levels across the country (Zeng 1996). However, as discussed in Chapter 3, this assumption was not reliable and most likely overestimated the degree of underreporting, and hence over-estimated the 'true' fertility levels. In fact, although Zeng's conclusion of data deterioration since the early 1990s has been widely accepted, his estimation of fertility around 2.1-2.2 in 1991-92 has not.

The second approach relies upon the annual surveys, mainly the official estimates of CBRs (columns 2-5 in Table 6.1). This was a common approach applied by most demographers during the intercensal period when other sources were not available. Some authors first derived a simple linear relationship between the total fertility and the crude birth rate calculated from the 1990 census. Assuming the same relationship between CBR and TFR, they made fertility estimations based on the annual series of

official estimates (Liu and Lin 2000; Qiao 1998). Others used a projection approach to age the female population from the 1990 census and then estimated fertility levels based on the official estimates (Attane 2001; Goodkind 2004; Yu 2002).

Because all these estimates started from the same basis, their estimates of fertility levels were similar, around 1.8 since the early 1990s; which has been the one most commonly accepted. By the late 1990s, the Chinese government also maintained that total fertility around 1.8 (Government of PR China 2002). The UN system also accepted the total fertility of 1.8 as China's fertility level in the 1990s, probably drawing on China's official sources (United Nations 2001). However, one obvious limitation of this approach is that the assumption of the same relationship between TFRs and CBRs over the decade largely ignored changes in women's reproductive behaviour. More importantly, too much credit was given to the official estimates of demographic change. As shown in Chapter 5, the SSB upwardly adjusted the fertility too far on the basis of untenable assumptions. Consequently, being affected by the SSB inflation, these estimates most likely over-estimated the levels of fertility.

The third approach mainly uses the recent 2000 census, but also draws on the annual surveys and the family planning statistics (columns 6-8 in Table 6.1). Many studies first compared cohorts aged 10-19 in 2000 to those aged 0-9 in 1990 to obtain the underreporting rates, and then applied the same degree of undercounting to younger cohorts in the 2000 census. It is too arbitrary for some demographers to assume that the 2000 census would undercount younger cohorts to the same degree as the 1990 census (e.g. Wang 2003b; Zhang and Cui 2003). In addition, they have certainly ignored the fact that these two censuses were conducted at different points in time under different socio-economic circumstances.

In general, none of previous estimates was free of shortcomings. On the one hand, they were restricted by the limited availability of data, but on the other hand, hardly any of them adequately justified the data they chose and the extent of underreporting of births they ascertained.

6.2 Negotiating the varying roles of data in fertility estimation

Theoretically, China has advantages in measuring and evaluating demographic changes, especially the levels and trends of fertility, given a collection of sources of data in population statistics. However, as shown in previous chapters, not all data meet the purpose of estimating fertility with reasonable assurance. In addition, the misunderstanding of data sources and confusion in data use have greatly misled the judgment in most analyses on the quality of data. Therefore, it is very important to evaluate the roles of different data sources in fertility estimation and to estimate the extent of underreporting in each source.

As is the practice of most demographers, this thesis also considers the two registration-based statistics, the *hukou* statistics and the family planning statistics, not to be suitable for fertility estimation. The omission of both married women and their births on a large scale in the *hukou* statistics precludes it from being used in fertility analysis. Similarly, the family planning statistics are unsuitable, because they suffer from both the concealment of births by individual couples and the falsification of birth records by local program workers. However, this does not mean that these two sets of statistics are quite useless. Regarding the out-of-plan births appearing in official statistics, it is almost certain that it would no longer be necessary for them to be concealed. In this case, the number of registered births in these statistics constitutes the minimum to evaluate the estimated number of births from other sources. For example, if any survey estimates or census enumerates fewer births or younger children than the registrations, one can safely reject the completeness of that source. A good example is that the 2000 census enumerated fewer children aged one year than were registered in the family planning statistics in 1999, as mentioned in Chapter 3 (see also columns 1-3 in Table 6.6).

There are also two important lessons from the analysis of these two sources. First, in the *hukou* statistics, many couples who had out-of-plan births were eager to justify their births through their being registered either as adopted children or as in-migrants, while many couples were not enthusiastic about registering their ‘in-plan’ births in a timely fashion due to the diminished importance of *hukou* in daily life.

Second, the low quality of family planning statistics primarily resulted from the manipulation and falsification of birth records by local program workers. The SFPC village surveys and many careful local studies demonstrated that face-to-face interviews carried out by trained enumerators could obtain more truths directly from respondents, once they successfully avoided interference from local cadres. Moreover, a large number of births were missed by the omission of young mothers rather than by the outright underreporting of births.

The situation is different in surveys and censuses, because these investigations were carefully designed and their data were gathered by trained enumerators through face-to-face interviews. In this case, it was expected that most underreporting of births came directly from respondents, although local cadres still played an important part. One of the disadvantages for nationwide surveys and censuses is that the operations have to rely heavily on local co-operation. For the sample survey, the smaller the survey, the more likely it is to employ trained enumerators to conduct household interviews. The larger the enumeration, the more heavily it relies on co-operation by local cadres, which is especially striking in the population census, mobilising 5-6 million enumerators across the country. Therefore, there are differences in the extent of underreporting of births, so the upward adjustment needed is dependent on whether one chooses census or surveys for analysis.

Empirical evidence suggests that fertility rates estimated from censuses and surveys are quite similar, although those estimated from censuses were slightly lower. The total fertility rates directly calculated from censuses were 2.62 in 1981, 2.25 in 1989 and 1.22 in 2000. The first two were quite close to the results from other sources, such as 2.70 in 1981 reported in the 1982 one-per-thousand survey, and 2.24 reported in 1989 from the 1992 survey. The census-recorded total fertility for 2000 of 1.22 was noticeably lower than the 1.45 observed in the SFPC 2001 survey, and 1.38 reported in the SSB 2001 annual survey. However, the fertility estimated using the own-children method, which can avoid the effects of migration of young mothers as mentioned in Chapter 4, was 1.38 in the census, still close to the survey-estimated figure (Retherford et al. 2004).

All the three most recent censuses undercounted newborns and younger children, but the problem in the 2000 census is more serious, mainly because of the huge number of migrants and the shortcomings in census procedures. Nevertheless, the 10 percent census long form is still usable in fertility analysis, because its samples had already been chosen based on households before the census enumeration. More importantly, it was less affected by the campaign to put back 'newfound' people, very likely including many double-counts, into the short form in the second-round census enumeration (Zhang and Cui 2003). Compared to annual surveys, the 1, 000-times-larger coverage of the census long form suggests its employment of enumerators on a large scale and hence more biases. By the same token, the 1995 one percent sample census may suffer from more underreporting of births than an annual survey, but is better than the census long form.

Both the 1982 and 1990 censuses have excellent age-sex reporting except in younger age groups, but this is not the case in the 2000 census, even in the long form. Therefore, when it is necessary to use the age structure of the whole population or of women of reproductive age, it is better to use the previous two censuses. Three life tables derived from the 1982, 1990 and 2000 censuses, which reported a decline in mortality level (Banister and Hill 2004). Since all three censuses suffered some extent of underreporting of deaths, it is safer to use the middle one, the 1989-90 census-based life table with a moderate mortality level.

There are many advantages in using the SSB annual surveys in reconstruction of fertility levels: (1) the only available time series of data; (2) the negligible sampling errors due to large sample size with nationwide representation; (3) its independence from the family planning program; and (4) the detected extent of underreporting of births in each survey from a more intensive post-enumeration survey. As examined in Chapter 5, the SSB official estimates adjusted fertility too high. From the information available, the fertility and births estimated from the unadjusted survey data are still more complete than all other sources.

The SFPC quinquennial surveys provide valuable sources to examine the problems in the 'current' status surveys. Because the three most recent surveys included only a single group of women aged 15-49, and suffered from underreporting of births close

to the survey time, the fertility series estimated from these surveys were lower than those from the annual surveys, and their smaller sample sizes imply greater sampling variations in detailed subgroup analyses. All these considerations make these retrospective surveys inferior to annual surveys in fertility analyses. The 1992 survey is without dispute not suitable, but both the 1997 and 2001 surveys are of comparatively good quality, proved by internal consistency, and consistencies between surveys. The 2001 survey has more complete reporting of births covering the whole decade, and is used in analysis in following chapters.

Consequently, for the purpose of reconstructing the path to below-replacement fertility in China in the 1990s, the primary data used in this research come from three sources: (1) the unadjusted data of the SSB annual surveys from 1991 to 1994 and 1996 to 1999; (2) data from the 1995 sample census and the long form of the 2000 census; and (3) the 2001 SFPC retrospective survey. In addition, the 1982 and 1990 census data and the 1990 census-based life tables (1989-90) are used when it is necessary to use the age structure of women of reproductive age.

6.3 Gauging the extent of underreporting in annual surveys

This section estimates the extent of underreporting of births in annual surveys, the 1995 sample census and the 2000 census long form. All these ‘surveys’ suffered ‘complete’ underreporting of births, either detected by the post-enumeration survey, or revealed in later statistical investigations. Other factors contributing to underreporting of births should also be taken into account, such as underreporting of births due to infant deaths, or the non-reporting of births due to the deaths of young mothers. Moreover, as shown in Table 4.5 in Chapter 4, in the large-scale sample census and census long form, there was data-specific underreporting, the ‘partial’ underreporting of births, primarily due to migration of young mothers or infants being misreported as in-migrants or adopted children.

It is more difficult to determine the extent of ‘complete’ underreporting of births than that of ‘partial’ underreporting. The analyses in Chapter 4 suggest that the 1982, 1990 and 2000 censuses may have underreported births by 4 percent, 8 percent and

11 percent, respectively. But caution is required because the extent of underreporting for the 1990 and 2000 censuses were estimated by using the 2000 census and education statistics, respectively. As already discussed, the latter two sources may have been to some extent inflated. Meanwhile, the analysis in Chapter 5 reveals that annual surveys may have underreported births by 6 to 9 percent, not more than 10 percent in the 1990s. While the SSB post-enumeration surveys suggested 6-7 percent underreporting in annual surveys in 1993-94, the upper limit of less than 10 percent underreporting from 1991-1996 is estimated by employing the 1998-2003 education statistics. Again, caution is required in estimating the exact extent in each year. Chapter 5 also shows that annual surveys included more, on average 1.5 percent of out-of-plan births, through misreporting second or higher-order births as first-order births from 1996 to 1999, rather than the normal practice of outright underreporting of higher-order out-of-plan births.

Although it can be safely assumed that annual surveys, including the 1995 sample census but not the 2000 census long form, have less than 10 percent 'complete' underreporting based on previous analyses, it is hard to determine the exact extent in each year. To reduce the arbitrariness in fertility adjustment, this study assumes two scenarios in estimating the extent of underreporting of births in selected sources from 1991 to 2000: (1) lower estimate: the results from the post-enumeration surveys in 1993-94 probably reflected the 'true' extent of underreporting of births in annual surveys, and (2) higher estimate: the extent of underreporting derived from the comparison with education statistics representing the average level over the period, but the relationship between each survey may have been the same. In the first scenario, it is assumed that annual surveys in 1991-92 suffered from the same extent of underreporting as the 1993 annual survey, while annual surveys from 1996 to 1999 had on average 1.5 percent lower levels than the 1993 survey. It is also assumed that the 1995 sample census and the 2000 census underreported births by 7 percent and 10 percent, respectively (Column 1 in Table 6.3). In the second scenario, it is assumed that annual surveys underreported slightly more births, but the relationship between surveys is similar as in the first scenario. Therefore, the annual surveys underreported births by 9.3 percent from 1991 to 1993, 8.9 percent in 1994, 7.8 percent from 1996 to 1999, and the 1995 sample census and 2000 census by 8 percent and 11 percent, respectively (Column 2 in Table 6.3).

Both the 1990 and 2000 censuses and the 1995 sample census were discovered to have 'partial' underreporting of births, as examined in Chapter 4 (see Table 4.5). However, this pattern seemed very weak in the annual survey, probably because survey interviewers devoted more effort to detecting underreporting. The extent of 'partial' underreporting of births calculated by the same method was around 0.2-0.3 percent during the whole period, which was roughly equal to the yearly death rate of women of reproductive age. On the other hand, all people are supposed to be enumerated in the census or sample census, and many births and younger children were probably reported but were placed in the category of non-own-births under such circumstances.

It was found that in some Asian countries, including China, newborns who died immediately after birth easily went unreported both as births and infant deaths (Coale and Banister 1994). In this case, the underreporting of infant deaths also meant the underreporting of births. In the absence of other strong evidence, this research chooses the surveillance data of infant deaths as a reference from the Ministry of Health, developed with help from the United Nation's Children's Fund (UNICEF) in the early 1990s (MOH 2000). Table 6.2 compares the infant death rates reported from the health systems and those from the SSB surveys. It appears that the observed infant death rates in annual surveys are slightly lower, with a difference ranging from one per thousand in 1994 to 5 per thousand in 2000, which is the estimated extent of underreporting of births due to infant deaths in this thesis.

Table 6.2 Comparison of infant death rates between the MOH and SSB sources in China, 1991-2000 (per thousand)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
MOH	50.2	46.7	43.6	39.9	36.4	n.a.	33.1	33.2	33.3	32.2
SSB	n.a.	42.3	41.6	38.8	32.3	34.0	37.4	33.1	26.7	26.3

Sources: The MOH series are from the MOH (2000); the SSB series are from the SSB (1991-2002).

In general, for annual surveys in the 1990s, and the 1995 sample census and the 2000 census long form, the extent of birth underreporting can be estimated by including the following underreporting: (1) the 'complete' underreporting due to concealment

of births from respondents, (2) the 'partial' underreporting due to migration or misreporting as in-migrants or adopted children, (3) underreporting due to infant deaths, and (4) underreporting due to the deaths of young mothers. Consequently, the estimated extent of underreporting of births in these surveys in each year is given in Table 6.3. It is very likely that the actual underreporting rates are slightly higher or somewhat lower, but this estimation is certainly a reasonable choice based on the available evidence and data.

Table 6.3 Estimated extent of underreporting of births in annual surveys, 1995 sample census and 2000 census long from in China, 1991-2000

Year	'Complete' underreporting rate		'Partial' underreporting rate (percent)	Other underreporting rate		Estimated underreporting rate	
	Scenario 1 (percent)	Scenario 2 (percent)		Due to mothers' deaths (percent)	Due to infant deaths (percent)	Scenario 1 (percent)	Scenario 2 (percent)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1991	6.9	9.3		0.3	0.4	7.6	10.0
1992	6.9	9.3		0.3	0.5	7.7	10.1
1993	6.9	9.3		0.3	0.2	7.4	9.8
1994	6.4	8.9		0.3	0.2	6.9	9.4
1995	7.0	8.0	6.27		0.1	13.4	14.4
1996	5.5	7.8		0.3	0.2	6.0	8.3
1997	5.5	7.8		0.3	0	5.8	8.1
1998	5.5	7.8		0.3	0	5.8	8.1
1999	5.5	7.8		0.3	0.7	6.5	8.8

Notes: The underreporting rate due to infant deaths in 1991 and 1996 is interpolated with reference figures in neighbouring years; the underreporting rate in 1997 was assumed as 0 due to the SSB reported infant mortality rate higher than the MOH source; the 'partial' underreporting rates are from Table 4.5, using reverse survival methods based on the 1995 sample census and 2000 census long form tabulations.

6.4 Estimating fertility levels and annual births in the 1990s

Because the fertility rates and the extent of underreporting of births are calculated from the survey samples, this analysis uses the estimated extent of underreporting to estimate 'true' births in the survey sample of each year, and then further estimates the fertility rates. The first step to re-estimate fertility is to match the unreported births to their mothers. There is no idea of the age of mothers of those unreported births, but they were most likely women aged below 35, especially the prime reductive age of 20-29. Most Chinese women have their first births in their early 20s and have the second or higher order births, if they have them at all, in their late 20s and early 30s (see Yu and Xie 2000). It is very helpful to use a five-year grouping to reduce the arbitrariness. Therefore, the newly estimated births are allocated to four age groups, 15-19, 20-24, 25-29 and 30-34. The allocation factors were determined with reference to the comparison between annual surveys and the 2001 survey in Chapter 5.

It has been shown that annual surveys mainly have two kinds of underreporting: early childbearing in younger age groups, and second or higher-order out-of-plan births. Consequently, the adjustment factors for the concealed births are allocated in the following way: 20, 30, 40 and 10 percent in the age groups of 15-19, 20-24, 25-29 and 30-34, respectively. However, the patterns of ASFRs differ in the 1995 sample census and the 2000 census long form, which reported higher fertility of women aged 15-19, but lower in the other three age groups. Consequently, the allocated adjustment factor for this group was set as 5 percent in the age group of 15-19. Therefore, the allocation factors for unreported births in the age groups from 15-19 to 30-34 were 5, 35, 45 and 15 percent in 1995 and in 2000.

It is quite straightforward to re-estimate age-specific fertility rates by dividing 'true' births by women at each five-year age group. Table 6.4 shows the reconstructed age-specific fertility rates and total fertility rates in the two scenarios from 1991 to 2000. In both scenarios, there was a clear trend over the course of the 1990s in decline of fertility, which first declined from around 2.0 to around 1.7 in the first half of the 1990s, and then further dropped to 1.5-1.6 in the second half of the 1990s. In the first

scenario, the fertility was 1.55 in 2000, while in the second scenario it was 1.59.

Table 6.4 Reconstructed time series of age-specific fertility rates and total fertility rates in two scenarios in China, 1991-2000

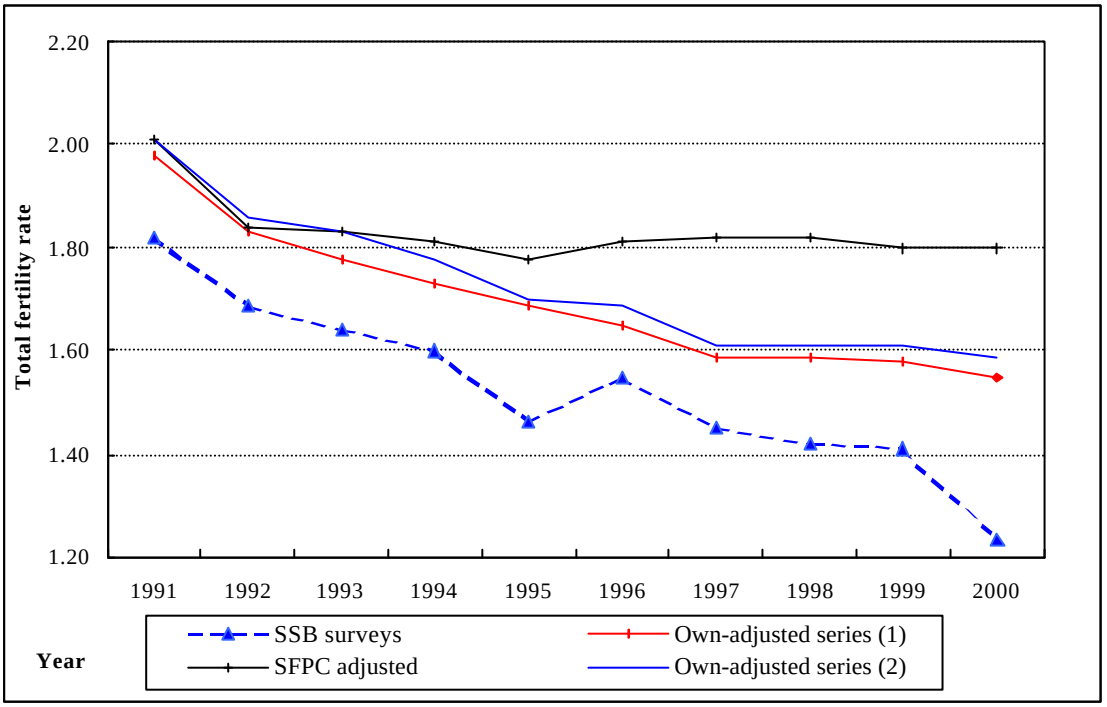
Scenario 1: Lower estimate of underreporting rate										
Age group	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
15-19	0.0153	0.0170	0.0171	0.0132	0.0138	0.0126	0.0078	0.0073	0.0077	0.0095
20-24	0.1795	0.1703	0.1625	0.1481	0.1700	0.1578	0.1357	0.1331	0.1295	0.1409
25-29	0.1350	0.1168	0.1216	0.1283	0.1103	0.1165	0.1286	0.1257	0.1260	0.1135
30-34	0.0462	0.0446	0.0402	0.0435	0.0339	0.0333	0.0366	0.0393	0.0418	0.0368
35-39	0.0130	0.0120	0.0102	0.0082	0.0057	0.0069	0.0073	0.0102	0.0099	0.0062
40-44	0.0060	0.0050	0.0034	0.0033	0.0016	0.0018	0.0012	0.0017	0.0013	0.0015
45-49	0.0016	0.0014	0.0012	0.0012	0.0006	0.0008	0.0006	0.0008	0.0004	0.0007
Adjusted TFR	1.98	1.83	1.78	1.73	1.68	1.65	1.59	1.59	1.58	1.55
Scenario 2: Higher estimate of underreporting rate										
Age group	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
15-19	0.0166	0.0151	0.0162	0.0165	0.0141	0.0148	0.0098	0.0093	0.0098	0.0100
20-24	0.1812	0.1693	0.1627	0.1516	0.1714	0.1604	0.1382	0.1358	0.1322	0.1442
25-29	0.1373	0.1244	0.1302	0.1300	0.1119	0.1195	0.1312	0.1285	0.1288	0.1168
30-34	0.0471	0.0454	0.0414	0.0447	0.0346	0.0341	0.0373	0.0400	0.0425	0.0379
35-39	0.0130	0.0120	0.0102	0.0082	0.0057	0.0069	0.0073	0.0102	0.0099	0.0062
40-44	0.0060	0.0050	0.0034	0.0033	0.0016	0.0018	0.0012	0.0017	0.0013	0.0015
45-49	0.0016	0.0014	0.0012	0.0012	0.0006	0.0008	0.0006	0.0008	0.0004	0.0007
Adjusted TFR	2.01	1.86	1.83	1.78	1.70	1.69	1.63	1.63	1.62	1.59

Sources: Own calculations, using the estimated extent of underreporting in two scenarios and allocation factors of unreported births among women of five-year age group, based on unadjusted data of annual surveys from 1991 to 1994 and from 1996 to 1999, 1995 sample census and 2000 census long form.

Figure 6.1 shows the re-estimated fertility series in both scenarios and those reported in surveys and census, as well as the SFPC official adjustment series. As can be seen, all estimates agree on the sudden fertility drop in the early 1990s. The new estimates suggest that fertility declined continually to a lower level in the second half of the 1990s, even though not so low as reported in surveys and census. This decline

suggests that fertility was not just 'at or below replacement level' as officially claimed (Greenhalgh and Winckler 2001: 64), but was far below replacement level over the course of the 1990s.

Figure 6.1 Total fertility rates observed in annual surveys, sample census and census, adjusted in the official sources and reconstructed in this thesis in China, 1991-2000



Source: The SSB observed series and the SFPC adjusted series are from the same source as in Table 5.5 in Chapter 5.

It is somewhat complicated to estimate the number of annual births. Some research suggests that annual surveys could bias in the mobile age groups of 20-45 (Su 1996; Zhang, Yu and Cui 1997); births will be overestimated or under-estimated if the births in samples are directly multiplied by the sampling ratio. This is supported by the comparison of the number of women of reproductive age and the proportion of women of prime reproductive age observed in annual surveys and estimated based the three most recent censuses (Table 6.5, see also Appendix Table A1). Therefore, the following analysis uses the estimated ASFRs and adjusted female population aged 15-49 in each year to estimate the number of annual births.

Table 6.5 Female age structure series observed in annual surveys and those estimated from the three most recent censuses in China, 1991-2000

Year	Adjusted number (millions)	Proportion of women aged 20-29 (Percent)	SSB observed (millions)	Proportion of women aged 20-29 (percent)
1991	312.58	7.6	314.56	7.8
1992	316.92	7.8	318.61	7.6
1993	321.56	7.6	324.09	7.4
1994	325.33	7.5	325.38	7.4
1995	329.25	7.3	324.15	7.0
1996	332.20	7.1	332.54	6.8
1997	336.61	6.9	336.71	6.6
1998	340.28	6.7	339.96	6.3
1999	343.17	6.4	341.53	6.0
2000	345.34	6.1	349.70	5.9

Sources: The SSB series are obtained by multiplying the sampling ratio with the female age distribution in each survey sample from the SSB (1991-2002); the own adjusted series are based on the 1982, 1990 and 2000 census and the 1989-90 life table.

To construct the age structure of women of reproductive age each year in the 1990s, three censuses, primarily the 1982 and 1990 censuses, are used to estimate female population aged 5-48 in 1990. Despite its distortion, the most recent 2000 census is also used to adjust younger age groups, those aged 5-9 in 1990. As these younger cohorts in the 1990 census were very likely to be underreported with an apparent intercensal survival ratio of 104.6, and women aged 15-19 in 2000 had already joined the labour migration with the possibility of being over-counted, a compromise is made to use 2.3 percent as the coefficient to estimate women who were aged 5-9 in 1990. The 1990 census is used to decide the number of women aged 10-18 in 1990, as these women who were aged 2-10 in 1982 were very likely to be underreported. For the estimation of the number of women in other age groups, both the 1982 and the 1990 censuses are used. Next, the 1989-1990 life table derived from the 1990 census is used to project women aged 15-49 in each year (Appendix Table A1).

Table 6.6 shows the number of births estimated from reconstructed fertility series in two scenarios and the number of births from other sources. As can be seen, in the first scenario, the adjusted birth figures (column 5) are a little lower than the SSB official estimates (column 4), but still higher than other sources, notably the series

estimated from the 2000 census. Using the estimated annual births as a reference, the 2000 census may still have undercounted by 26 million younger children aged below 10 in 2000. In the second scenario with slightly higher estimation of extent of underreporting, the total estimated births from 1991 to 2000 were 5 million more than the lower estimates. This also suggests that the 2000 census may have undercounted younger children by 31 million. However, as can be seen (column 6), the re-estimated series were higher than the official estimates in 1991-92, and quite close to them from 1993 to 1996. As already discussed in Chapter 5, the official estimates have over-estimated the number of annual births. Evidently, the estimated extent of underreporting of births in the second scenario was on the higher side. Comparatively, the estimated underreporting extent in the first scenario and the accordingly reconstructed series of total fertility rate appear closer to the truth.

Table 6.6 Comparison of estimated annual births and those figures in other sources in China, 1991-2000

Year	*Hukou* birth registration (millions)	SFPC birth registration (millions)	Census-estimated births (millions)	SSB official estimates (millions)	Re-estimated births in scenario 1 (millions)	Re-estimated births in scenario 2 (millions)
	(1)	(2)	(3)	(4)	(5)	(6)
1991	16.81	16.97	20.87	22.58	22.28	22.63
1992	15.10	15.96	19.48	21.19	21.09	21.41
1993	14.52	15.70	18.60	21.26	20.60	21.12
1994	14.28	15.75	17.09	21.04	19.96	20.49
1995	14.40	15.21	17.56	20.63	19.48	19.70
1996	14.30	14.55	15.77	20.67	18.86	19.34
1997	13.86	13.88	14.96	20.38	18.20	18.62
1998	13.43	13.83	14.48	19.42	17.78	18.23
1999	13.67	12.88	11.85	18.34	17.28	17.73
2000	16.21	12.92	14.08	17.71	16.33	16.77
Total	146.58	147.65	164.74	203.22	191.86	196.04

Sources: The *hukou* series are from the MPS (1991-2000); the SFPC series are from the CPIRC research report (2003); the 2000 census series are taken from Zhang and Cui (2003: 27); the SSB series are from the SSB (1991-2002).

In general, both estimates suggest an accelerated decline of fertility to a very low level, and more importantly, a more than 30 percent reduction in annual births. For the information available, the first scenario appears to be closer to reality, which indicates that both fertility decline and cohort reduction were more considerable. The analysis also suggests that surveys and census basically reflect a changing reality even allowing for some extent of underreporting of births. However, the 6 to 10 percent underreporting of births is undoubtedly a serious data problem, which calls for further efforts from government agencies to improve data quality.

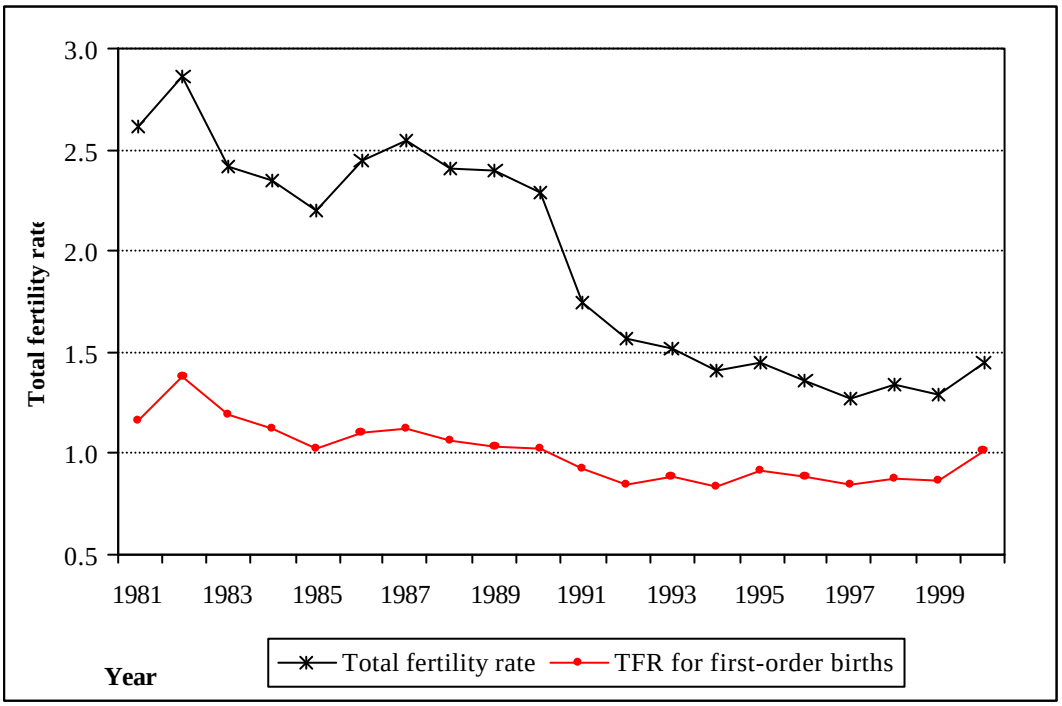
6.5 'Tempo' effects on the conventional measure of total fertility

The very low fertility continually reported in surveys and census was considered by many demographers to be the result of serious underreporting of births. The above analysis suggests that even allowing for about 10 percent underreporting, fertility declined very quickly to a very low level. In fact, as well as the actual decline of fertility, 'tempo' effects due to rising age at childbearing, can also bring down the value of conventional measure of total fertility (Bongaarts and Feeney 1998). In the case of China, the effects of the changing childbearing schedule on period total fertility have been widely discussed (Gu 1992; Gu 1994; Guo 2000a; Guo 2000c; Xu 1983; Zha 1983), but unfortunately, such analyses did not attract much attention from the demographers who strongly maintained the serious-underreporting argument. Before examining the underlying causes of the decline of fertility, it is necessary to briefly review the distortion of the conventional fertility measure.

The conventional total fertility measure excludes the effects of changing age structure, but does not avoid the effects from changing marriage and childbearing ages. As shall be explored in Chapter 8, non-marital fertility is negligible and the change in age at marriage in turn results in change in age at childbearing. The past two decades were marked by a declining age at marriage and childbearing in the 1980s and rising age in the 1990s. Consequently, these changes resulted in the inflation of period fertility. Because the original data of annual surveys are not available, this study resorts to retrospective surveys to show these effects. Figure 6.2 presents the estimated total fertility rates for all births and for first-order births from

1981 to 2000, which shows the effects of changing marriage and childbearing pattern on the conventional measure of total fertility. Although all surveys suffered from underreporting of births, this primarily occurred to births of second and higher-order as discussed in previous analysis. In the Chinese context, it was not necessary and less likely to underreport first-order births to a large extent, except some proportion of early marriage and early childbearing.

Figure 6.2 Estimated total fertility rates of all births and first-order births in China, 1981-2000



Sources: The 1981-1984 series are from Yao (1995: 294-298); the 1985-1989, 1990-1994 and 1995-2000 series are from the 1992, 1997 and 2001 surveys, respectively.

Note: To reduce the effects of underreporting of births, this figure only uses fertility figures in one survey in several years ahead of the survey time.

As can bee seen, from 1981 to 1990, the total fertility for first order births exceeded 1, but it was lower than 1 from 1991 to 1999. Compared to the 1980s, the total fertility for first-order births on average was 0.24 child lower in the 1990s. As the fertility declined further in the 1990s, this deflation further reduced period fertility downward to an unbelievably low level. Drawing on 1997 and 2001 surveys, some authors showed that the application of tempo-adjusted total fertility suggested a higher level of fertility over the decade, even without taking underreporting of births into account (Ding 2003; Guo 2000a). They suggested that this was closely related to

delayed marriage, rising childbearing age and increasing birth interval. The important implication is that it is too arbitrary to attribute the reported very low fertility to underreporting of births alone. Certainly, their application of the tempo-adjusted approach only obtained little higher fertility estimates. The actual decline of fertility was still the major reason for the very low values of total fertility observed in surveys and census.

6.6 Contributions to fertility decline from the rapid socio-economic development in the 1990s

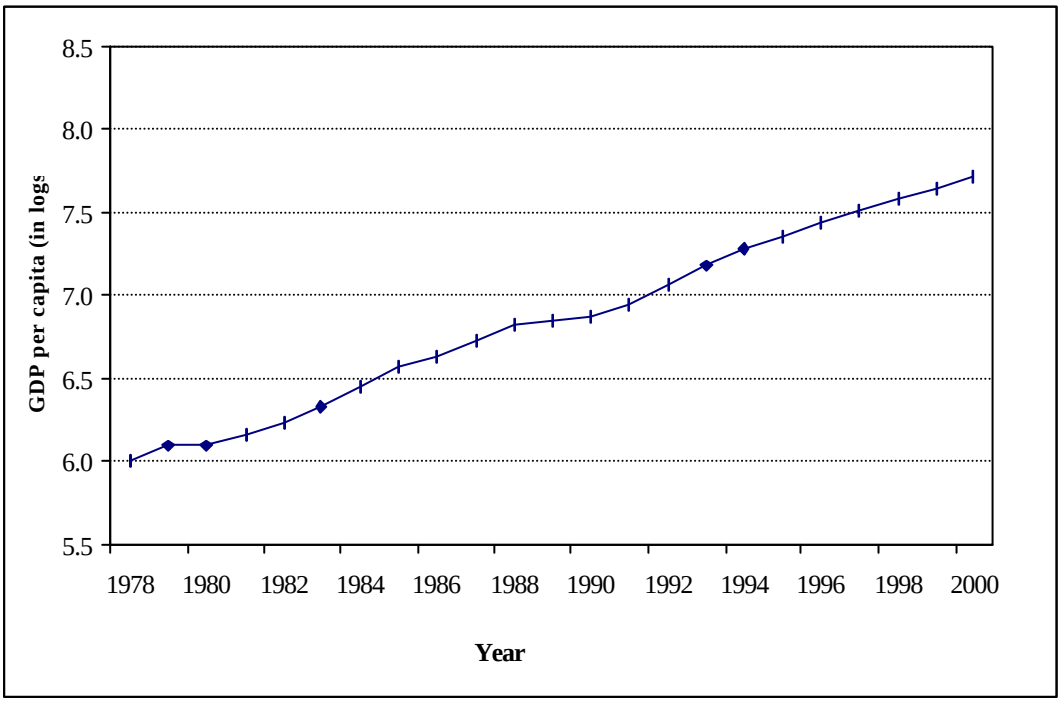
As mentioned in Chapter 1, previous studies have illustrated that both the family planning program and socio-economic development played important roles in the decline of fertility in China during the past decades. It is most likely that these two variables were the major determinants of the continued decline of fertility in the 1990s. Compared to the preceding decade, the 1990s enjoyed an accelerated socio-economic development, while the family planning policy was maintained stable. It is of interest to explore the contributions from development to fertility decline,

In explaining the pace of fertility transition in differing national patterns, Casterline (2001: 37-38) proposed four key determinants, namely: (1) the pace of social and economic change, (2) the pace of change in economic aspirations and expectations, (3) the pace of improvement in the provision of family planning services, and (4) the pace of reduction in the moral and social costs of family planning. It appears that all these four criteria were met in China in the 1990s, while the last two had already been met shortly after the starting of the nationwide family planning program in the 1970s. The official family planning program has always provided couples with free contraceptives. The program reorientation in the 1990s likely offered improved quality of family planning service. In addition, the implementation of the family planning program for decades has already suppressed any moral opposition. However, the first two determinants seemed more outstanding in the 1990s, driving fertility decline more quickly than expected.

Since implementing the reform-and-open-up policy in the late 1970s, China has

achieved rapid economic increase (Figure 6.3). In 2000, China's real GDP was 8, 940 billion RMB, equal to 1, 000 billion US dollars, ranked as No. 6 in the world. Although China was still in the group of lower-middle-income countries, its tempo of development was second to none. During the 1990s, China experienced accelerated socio-economic development with the increase in per capita GDP at an average yearly rate of 8 percent and quadrupled the GDP per capita within two decades. Such rapid development can only be competed by other Asian new industrial countries at certain development stage, such as Japan, the Republic of Korea and Singapore. It can be expected profound societal changes in educational achievement, urbanisation level and common values would occur along with rapid economic development. Certainly, it is important to note that the rapid economic development also enabled the Chinese government to invest more funding in the family planning program. Thus, both at the individual level and at the macro level, socio-economic factors would play an important role affecting fertility in the 1990s.

Figure 6.3 Growth of GDP per capita in China, 1980-2000 (in 1980 constant price)



Source: Own calculations based on figures from the SSB (1991-2001).

The social transformation resulting from this rapid growth was remarkable. The urban proportion rose from 20.6 percent in 1982 to 26.2 percent in 1990, and further

to 36.1 percent in 2000. Despite the different definitions used in censuses, there was no disputing huge number of peasants that have lived in urban areas (Zhou and Ma 2003). The Chinese government devoted much effort to education and the illiteracy rate of people aged above 15 dropped from 22.8 percent in 1982 to 15.9 percent in 1990 and further to 6.7 percent in 2000 (SSB 2002b). The regional disparities in development were still obvious in the 1990s, but the country as a whole had made real progress. For example, although the eastern coastal provinces benefited more from the rapid development, the level of per capita GNP for middle China in 2000 exceeded the level of eastern areas in 1990. The tempo of the increase in the urban proportion in middle China also exceeded that in eastern areas (SSB 2002b).

Certainly, development did not bring prosperity and wealth equally for everyone, especially in rural areas. Although rural reform increased peasant income initially in the early 1980s, rapid development and increasing urban-rural disparity soon ended this 'honeymoon', producing a much less favourable position for peasants. For example, although the average household income of peasants increased by 12 times from 1980 to 2000, the income ratio of urbanites to peasants, after first declining from 2.5 in 1980 to 1.83 in 1984, then reversed increasing to 2.2 in 1990 and further to 2.8 in 2000 (SSB 1991-2002). As a result, the growing rural-urban disparity and the declining agricultural income brought about huge rural-urban migration, amounting to 140 million in 2000 (SSB 2002b). In addition to earn money, one consequence for this large-scale transformation was to expose migrant peasants to a different world and new ideas.

During the 1990s, the deepened market-oriented reforms and the merging into the global economy also enabled urbanites to witness, or even experience, what has occurred and what is occurring in the outside world. Therefore, when young urbanites were eager to enjoy a middle class life, e.g. owning a car, buying a big house, or going overseas, etc., it will not be a big surprise that the young peasants who migrated to cities and witnessed the urban prosperity, also desire the lifestyle their urban counterparts have already had. All these could generate real difference in people's attitudes, ideas and aspirations and accordingly in behaviours.

The lower developmental level was often given as evidence to reject very low

fertility in China. However, considering experiences from many Asian new industrial countries, the pace of development is more important than the real level. It is necessary to reiterate what Freedman (1979: 4) described 25 years ago: 'it is crucial that increasing numbers of people have become aware of alternatives to their traditional lifestyles and aspire to something different, even though these aspirations often are poorly defined'. In fact, what Freedman concluded came from the experiences in Taiwan and Thailand, but it occurred in China decades later.

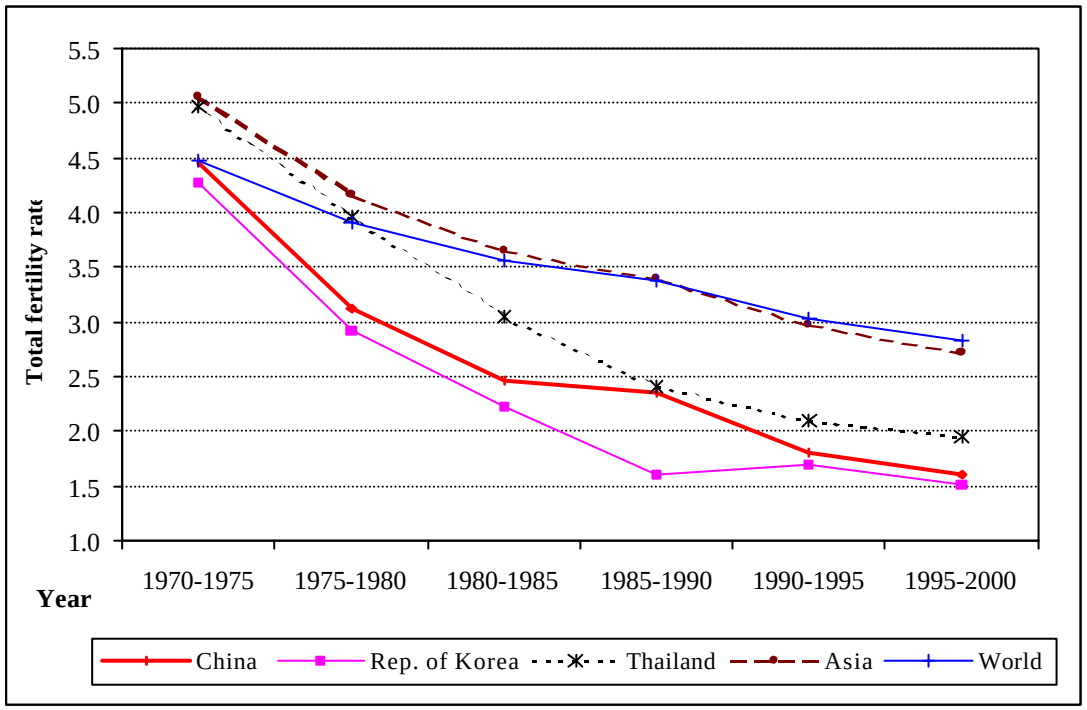
6.7 China's fertility decline in international perspective

From the international perspective, the dramatic fertility decline in China since the early 1970s was just part of the story of global fertility transition after World War II. According to the United Nations, in 1970, only 13 countries had fertility at or below replacement level, but by the year 2000, this figure had increased to 59, covering 44 percent of the world population (United Nations 2002). The pace of fertility decline in Asia, in particular in Eastern and Southeast Asian countries, was distinguished. For example, the very low fertility has persisted for a considerable period in Japan, Singapore and the Republic of Korea (Caldwell, Caldwell and McDonald 2002; United Nations 2003). In the less developed countries, such as Thailand, fertility not only declined rapidly during the past three decades, but more importantly, fell below replacement level by the end of last century (Prachuabmoh and Mithranon 2003)

It is of interest to examine China's demographic experiences compared with some similar Asian countries. For this purpose, the Republic of Korea (hereafter Korea) and Thailand are singled out, because both had experienced rapid socio-economic development as well as rapid fertility decline in recent decades, and both had prenatal government policy and rapid population growth before the 1970s, much like the situation in China. Moreover, both have strong family planning program, but not as strong as China's program. While Korea shares similar Confucian cultural influences on reproductive behaviour with China, Thailand has a different Buddhist tradition. Certainly, the developmental level, primarily measured by GNP per capita, was highest in Korea, followed by Thailand, and China comes last. According to the United Nations Human Development Report (United Nations 2004), Korea had high

human development with a Human Development Index (HDI) as 0.875 in 1999, while both Thailand and China had medium human development with HDIs of 0.757 and 0.718, respectively. Figure 6.4 shows the fertility changes in China, Korea, Thailand, all Asian countries as a whole and the world, during the period from 1970-75 to 1995-2000.

Figure 6.4 Total fertility rates in China, South Korea, Thailand, Asia as a whole and the world, 1970-2000



Source: These series are taken from the United Nations (2003).

Korea had had high fertility since the 1950s, of which the total fertility reached 4.5 in 1970 (United Nations 1992). During the 1970s, the Korean government conducted a strong family planning program and quickly brought the fertility down to replacement level by 1984. But just two years later, the total fertility further declined to 1.6 in 1986. From 1986 to 1997, Korean fertility fluctuated between 1.6 and 1.8, and then resumed the decline to 1.3 in 2001. While the successful family planning program has primarily been praised for leading to the rapid fertility decline by the late 1980s, socio-economic factors played a more important role in the 1990s (Caldwell, Phillips and Khuda 2002; Cho and Lee 1999). Choe and her colleagues (2004: 2) demonstrated that declines in marital fertility accounted for about three-

fifths of TFR decline and the postponement of marriage was responsible for the other two-fifths in the 1980s, while most of the slight declines of TFR in the 1990s came from changes in marriage.

During the transition process towards very low fertility, there was a sudden drop of total fertility from 2.1 in 1984 to 1.6 in 1986. The reason for this was not clear. Given the reliability of Korean statistics, it seems unlikely to have been the result of underreporting of births in statistical investigations. According to Choe (2004), during these years, there was a sudden increase in marriage postponement and reduction of higher-order births. This was similar to that occurred in China in the early 1990s. As shown in Chapter 2, the family planning program was greatly strengthened with a huge increase of family planning operations. Surveys also provide evidence of the postponement of marriage and reduction in the proportion of parity progression. All these resulted in the same effects on fertility. Therefore, the Korean experience supplies indirect evidence that the same kind of fertility drop in China from 1990 to 1991 was not impossible.

Fertility was very high in Thailand before 1970, on average 6.2 during the period from 1965-1969 (Prachuabmoh and Mithranon 2003). Concerned about the rapid population growth, the Thai government announced the voluntary family planning program in 1970. From then on, fertility in Thailand declined, with a 30 percent reduction of total fertility from on average 5.4 in 1970-74 to 3.9 in 1975-79. Moreover, the total fertility further declined in the 1980s with another 40 percent reduction from 3.8 in 1980 to 2.3 in 1990 (United Nations 2001). This was closely associated with the economic take-off and the corresponding socio-economic changes, such as the improvement of education, female employment, rising marriage age and increasing contraceptive use. During the 1990s, fertility in Thailand further declined to below replacement level at 1.8 in 2000, and seemed not affected by the 1997 economic crisis (Prachuabmoh and Mithranon 2003).

It is of special interest to compare the fertility transition between China and Thailand. Although the rapidity of fertility decline in China was frequently praised, as a matter of fact, the pace of fertility reduction in Thailand was almost equal to that in China, about 70 percent reduction during the three decades from 1970 to 2000.

Both countries experienced rapid economic take-off in certain period, while the Thailand's economy developed earlier than China's, but stalled due to the 1997 crisis and has revived since, but China's economic development accelerated in the 1990s and continued after 1997. By the year 2000, the figure for per capital GDP in Thailand was US$6, 400, while this figure was only US$1, 000 in China owing to the huge population base, even though the urban areas were much developed. Thailand's voluntary family planning program is effective, but certainly is not so powerful as the compulsory program in China. However, the experiences of fertility decline differed considerably in different stages. In the 1970s, the pace of fertility decline was faster in China than in Thailand, but this relationship reversed in the 1980s, when Thai fertility continued to decline but China's fertility stalled above the replacement level. It was only in the 1990s that China resumed the decline and both countries reached similar levels. Considering the experience in Thailand, there is no reason to question the achievement of far below-replacement fertility in China given its rapid socio-economic development and compulsory family planning program.

In general, when China's demographic experience is appraised from an international perspective, there are similarities in many aspects across countries, but less uniqueness. The experience of European countries and many Asian countries demonstrated that fertility decline did not stop at replacement level, but went further below this level. Comparison with Korean and Thai experience suggests that rapid fertility decline to a very low level was possible under the conditions of rapid socio-economic development and effective family planning programs. Compared to these two countries, China's developmental level was still rather low but the pace of development was second to none. Moreover, the strength of program efforts was effective in the 1990s. Consequently, there seems good reason to believe the rapidity of fertility decline in China during the 1990s.

6.8 Conclusion

After carefully reviewing the data-specific problems in each data source, this chapter goes further to evaluate their roles in fertility estimation. It is concluded that sample surveys are more useful than censuses and registrations in minimising the extent of

underreporting of births. This research employs annual surveys from 1991 to 1994 and from 1996 to 1999, the 1995 sample census and 2000 census long form to reconstruct the path to far-below-replacement level fertility in the 1990s. Based on analyses in previous chapters, the extent of underreporting of births was estimated and the 'newfound' were put back by mothers at five-year groupings with reference to fertility pattern in the 2001 survey.

Because of data limitations and the difficulty of determining the exact extent of underreporting of births, this analysis assumes two scenarios in the estimation of the extent of underreporting over the decade. Consequently, it obtains two series of estimated total fertility rates. However, both series clearly show that fertility in China declined very quickly and went far below-replacement level, around 1.5-1.6 in the second half of the 1990s. This study employs the female base population, constructed using the 1982 and 1990 census and the 1989-90 census-based life table, and the reconstructed age-specific fertility rates to project the births during the 1990s. The comparison of estimated number of births with other independent sources suggests that the assumption for the first scenario is close to home.

In the Chinese context, three causes contributed to the reported very low fertility in surveys and census: (1) underreporting of births; (2) tempo effects on fertility measure; and (3) actual fertility decline. Many authors who maintained the serious-underreporting argument largely neglected the latter two causes. This analysis shows that fertility declined quickly and deeply in the 1990s even allowing for some extent underreporting of births. The downward 'tempo' effects on total fertility were obvious as illustrated by the total fertility rates for first-order births below 1 over the decade. But the actual decline in fertility was the major reason for the observed very low fertility, because the application of tempo-adjusted approach obtained a little fertility series. Both the strong family planning program and the rapid socio-economic development contributed to this quickened decline, but the rising aspirations and expectations during the economic take-off stage were more likely to have been the underlying mechanisms driving fertility downward in the 1990s.

Chapter 7 Foundation of Achieving Very Low Fertility: Changes in Fertility Preferences

This chapter examines changes in fertility preferences during the past three decades, as the experiences of other developing countries have demonstrated that fertility preference is an important determinant of aggregate fertility levels (Bongaarts 1992). From the start, China's family planning program has restlessly promoted ideas such as 'having fewer births and healthy births' (*shaosheng yousheng*), and 'girls and boys are the same' (*nahai nvhai dou yiyang*). The changes in fertility preferences, in particular the reduced gap between the program requirements and popular preferences, would provide a solid foundation of rapid decline of fertility to a very low level. Fertility preferences include the preferences on the number and sex composition of children that a woman wants. In this thesis, the terms 'ideal family size', 'desired number of children', and 'preferred number of children' are used interchangeably, while 'sex preference' or 'son preference' are both used to refer to preference on sex composition.

Because the information of fertility preferences came from retrospective surveys in most cases, one general concern about fertility preferences is that the answers given by women at the time of survey could be affected by *ex post* rationalisation, i.e. women's unwillingness to admit unwanted births. Nevertheless, a number of detailed studies suggested that responses on fertility preferences in survey data were meaningful and deserved serious consideration (United Nations 1987). Moreover, the practice of analyses restricting responses to younger married women proved helpful in reducing the effect of the after-the-fact rationalisation of existing number of children (Knodel et al. 1996).

There are some specific concerns about the study of fertility preferences in China. For example, it was suspected that Chinese women would understate their fertility preferences through 'politically correct' answers due to government pressure from the one-child policy (Hermalin and Liu 1990). However, a number of surveys at the provincial level, and careful case studies at the local level, suggested that this was

not the case, because few women stated their preference for the officially advocated one child only, but insisted on one child of each sex (e.g. Feng and Zhang 2002; Greenhalgh 1994; Whyte and Gu 1987). On the other hand, as argued by Merli and her colleagues (2004), for the whole generation that grew up under the influence of the family planning program over the past three decades, the concept of family planning and very small family size may have already been internalised as 'true' preferences. Nonetheless, caution is required in interpretation of the decline in the desired number of children for below-replacement fertility, because more recent research reports that in post-transitional society, mainly in European countries, the desired number of children was higher than the actual fertility (Bongaarts 2001).

This chapter is arranged as follows: Section 7.1 reviews the available literature about fertility preferences from the 1970s to the late 1990s. Section 7.2 examines the trends in ideal family size in the late 1990s and early 2000s drawing on two recent nationwide surveys. Section 7.3 discusses the possible underlying causes for the decline in ideal family size from the perspective of societal changes, especially changes conducive to reducing peasants' desired number of children. Section 7.4 examines the effects of ideal family size on actual fertility. Section 7.5 reviews the evidence on son preference from previous studies and the 2001 survey. Section 7.6 further examines the effects of son preference on the fertility outcomes. Section 7.7 briefly discusses the relationship between ideal family size and actual fertility. Section 7.8 summarises the findings of this chapter.

7.1 Trends of decreased ideal family size from the 1970s to the mid-1990s

There are very limited sources on fertility preferences in the 1970s. One local study in Beijing Municipality in 1979 suggested that the average desired number of children was 1.78 for young peasants aged 15-30, while it was 1.32 for their urban counterparts (cited in Feng and Zhang 2002). Given the high socio-economic status in Beijing, this certainly did not represent the national level. Another study suggested that the modal Chinese peasant probably wanted two sons and a daughter in the 1970s (Parish and Whyte 1978).

There was evidence indicating that the mean desired number of children declined from three children to slightly more than two as early as the first half of the 1980s. Whyte and Gu (1987) estimated that the average ideal family size for rural peasants was 1.96, based on surveys in rural areas of nine provinces from 1982 to 1985. The average desired number of children for urbanites was 1.58 according to six surveys in cities from 1983 to 1985. More importantly, they found that most people still preferred the traditional Chinese norm of a 'complete family with one son and one daughter' (*ernu shuangquan*), to either the traditional large family or the officially advocated one child only. Nevertheless, they argued that the actual ideal family size would be a higher than two children:

> It would be misleading, then, to conclude that the modal family size preference, as revealed in China survey data, is two children. Given this sort of underlying preference, a considerable number of families with two daughters or two sons could be expected to continue bearing children, if the family planning program did not inhibit them from doing so (Whyte and Gu 1987: 478).

From 1985 to 1987, the SSB in collaboration with the International Statistical Institute (ISI) conducted a two-phase In-Depth Fertility Survey (IDFS) in seven provinces and two municipalities. These surveys provided detailed information on fertility preferences in the second half of the 1980s. The IDFS Survey (Phase-I) in 1985 reported that the average desired number of children was 1.6 in Shanghai, 2.2 in Hebei province and 2.5 in Shannxi province under the current family planning policy, respectively (Hermalin and Liu 1990; Wang 1996). The IDFS Survey (Phase-II) in another six provinces reported that the ideal family size for women at first marriage was 1.7 in Beijing, 1.9 in Liaoning, 2.1 in Shandong, 2.9 in Guangdong, 3.1 in Guizhou, and 2.8 in Gansu under the current family planning policy. Under the assumption of lifting the current family planning policy, the desired number of children increased a little, from 2.0 in Beijing to 2.2 in Liaoning, 2.5 in Shandong, 3.2 in Guangdong, 3.6 in Guizhou and 3.2 in Gansu in 1987 (International Statistical Institute 1991).

Using the IDFS data for Hebei and Shannxi province, Wang (1996) reported that about 60 percent, preferred two children, regardless of their residence, educational attainment, or whether they had already made a commitment to the one-child policy by signing the one-child certificate. Around 20 percent of women still desired three or more children. Wang also found that the desired number of children of a woman was statistically significantly associated with her acceptance of the one-child certificate, and her likelihood of continuing to have a second child.

Until 1990, it was suggested that the mean desired number of children was still above two children per family. For example, Zeng (1997) made a comparison between the actual fertility levels in 1990 and those required by the family planning policy at the provincial level. He reported that the actual fertility of 2.31 in 1990 was 42.6 percent higher than the policy-required fertility, indicating that most women had a higher family size preference than the program demanded.

But a number of field studies and surveys suggested that important changes in fertility preferences had occurred since the early 1990s. In 1992, the Population Institute of the Chinese Social Science Academy (CSSA) conducted a sample survey in 10 provinces and cities to investigate fertility preference (hereafter the 1992 CSSA survey). This survey asked married respondents about their fertility preferences before and after having children (Tian 1995). Of those women who had a clear preference before childbearing, the average ideal family size was 1.65 for urban women and 1.89 for rural women in 1992. It was reported that about 36 percent of urban households (N=3, 545) and 44 percent of rural households (N=1, 553) with one child only complained that the number of their children was ‘not enough’. Meanwhile, 89 percent of urban families (N=1, 418) and 87 percent of rural families (N=2, 243) with two children were satisfied with their achieved number of children. In addition, 43 percent of urban families (N=1, 483) and 23 percent of rural families (N=1, 955) with three children considered three to be ‘too many’ (Shao 1999).

In two consecutive field studies conducted in rural villages of Shannxi province in 1988 and 1993, Greenhalgh and her colleagues described the subtle but important changes in fertility preferences (Greenhalgh 1994; Greenhalgh, Zhu and Li 1994). It was reported that in the late 1980s villagers considered it necessary to raise two

children, the best sex composition being one son and one daughter, though more than two were still acceptable. However, by 1993 they probably still preferred two children, but with growing emphasis on daughters. While villagers managed to avoid having three children or two sons, some of them would adapt to the fact of having two daughters. Other local studies also confirmed such a change in fertility preferences. Choe and Tsuya (1991) reported that the ideal family size for female peasants aged 15-59 in Jilin province was 1.95 in a 1985 Survey on Rural Fertility and Living Standards. Ten years later, another survey in the same area suggested that women's deal family size had declined to 1.6 (Zhou, Guan and Li 1997).

No uniform national figures on fertility preferences were available until 1997 when the SFPC survey included such a question, as did the following 2001 survey. But the previous studies well convey the trend of decreased ideal family size over time. As one comprehensive study concluded, the average desired number of children for peasants declined from 2-3 in the mid-1980s to two in the 1990s, and for urbanites from 1-2 in the 1980s to one in the 1990s (Feng and Zhang 2002: 25).

7.2 Looking closely to the continued decline during the late 1990s and early 2000s

Both the 1997 and 2001 SFPC surveys have one question on fertility preferences. Although the information obtained may be simple, the fact that both surveys collected socio-demographic information and fertility histories of married women permits the analysis of the relationship between ideal family size and actual fertility. Although similar, the question wording and interview procedure differ in the two surveys. The question in the 1997 survey was 'What do you think is the ideal number of children for a family? And how about the sex composition?' The questionnaire gave a number of options, but the interviewers were asked to record the respondents' answers. The question in 2001 was: 'How many children do you think are ideal for a family?' After the respondent gave the answer, the interviewers asked the respondents to specify the ideal sex composition. As mentioned in Chapter 5, the two surveys used roughly the same sampling frame and sample size. Although the two surveys did not constitute panel data, they can be used to examine the trends.

Table 7.1 shows the ideal family size of married women by five-year age group. It does not include younger women aged 15-19, because many of them were still in school and most of them had not yet married and probably did not have clear fertility preferences. As can be seen, the cohort shift in fertility preference was obvious. The younger the women, the smaller the desired number of children they indicated. For example, women aged 45-49 in 1997 desired on average 1.86 children, 12 percent more than the average number of 1.63 desired by women aged 20-24 in the same year. In 2001, the average desired number of children of women aged 45-49 was 20 percent higher than that of women aged 20-24 (1.87 and 1.48). In both surveys, the proportion of women who preferred two children was higher among older age groups. While women aged 35 and above in both surveys stated roughly the same ideal family size, a clear and important declining trend is obvious among women aged below 30. For women aged 20-24, the mean desired number of children declined 9 percent from 1.63 in 1997 to 1.48 in 2001. Meanwhile, women aged 25-29 also decreased with 5 percent in average ideal family size from 1.71 in 1997 to 1.62 in 2001.

Table 7.1 Percentage distributions and mean desired number of children of married women by five-year age group in China, 1997 and 2001

Age group	1997 survey					2001 survey				
	Desired number of children (N=12, 518)					Desired number of children (N=32, 797)				
	0	1	2	3+	Mean	0	1	2	3+	Mean
20-24	1.3	43.4	51.5	3.8	1.63	0.3	47.9	48.3	3.5	1.48
25-29	0.6	33.2	61.6	4.6	1.71	0.5	41.0	54.3	4.2	1.62
30-34	0.5	27.5	66.2	5.8	1.77	0.8	32.9	61.2	5.1	1.72
35-39	0.6	27.4	65.8	6.2	1.78	0.8	29.7	62.3	7.2	1.78
40-44	0.3	22.9	70.3	6.5	1.83	1.0	29.1	60.7	9.2	1.82
45-49	0.3	22.1	68.8	8.8	1.86	0.8	24.8	64.4	9.9	1.87
Total	0.4	26.5	67.6	5.5	1.77	0.8	32.6	59.9	6.7	1.73

Source: Own calculations based on the 1997 and 2001 surveys.

Note: Due to the small number of cases of urban women stating that they wanted more than two children, they were added to those who preferred two children.

Table 7.2 presents the percentage distributions and mean desired number of children as stated in the 1997 and 2001 survey, including responses both for all currently

married women and for married women below the age of 30. As suggested by Knodel and his colleagues (1996: 309), the approach of restricting consideration to married women aged below 30 would reduce to some extent the after-the-fact rationalisation, because younger women were less likely to have already exceeded their ideal number of children. In addition, the responses of younger women would better represent recent fertility preferences. As shown in Table 7.2, the mean number of desired children for all married women was 1.77 in 1997 and 1.73 in 2001, while the figure for younger married women was lower, 1.70 in 1997 and 1.61 in 2001. In each survey, the majority of women in both groups expressed a two-child family size preference, while a small proportion preferred three children or more and a very small proportion desired no children.

Table 7.2 Percentage distributions and mean desired number of children by married women aged 20-49 and aged 20-29 in China, 1997 and 2001

Respondents/desired number of children	1997 survey	2001 survey
Married women aged 20-49	(N=11, 750)	(N=32, 797)
0	0.4	0.8
1	28.0	32.6
2	65.5	59.9
3+	6.1	6.7
Total	100	100
Mean	1.77	1.73
Married women aged 20-29	(N=4, 018)	(N=9, 144)
0	0.4	0.5
1	34.1	42.1
2	60.8	53.4
3+	4.8	3.9
Total	100	100
Mean	1.70	1.61

Source: Own calculations based on the 1997 and 2001 surveys.

Note: All surveys refer to currently married women; all non-numerical responses are excluded.

While there was a clear two-child preference both for all women and for younger women in 1997 and 2001, a slight but important shift in distribution of responses towards preference for one child can also be identified. Of all married women, while

28 percent preferred one child and 65.5 percent two children in 1997, 32.6 percent stated a preference for one child in 2001 and 60 percent desired two children. For younger married women, the decline trend was more obvious. For example, 34 percent of younger married women preferred one child in 1997, but 42 percent favoured one child by 2001. In 1985, according to the Phase-I IDFS survey data, 73.8 percent women preferred two children, and 17 percent desired three or more in Hebei province, while 69.4 percent preferred two children, and 24.5 percent wanted three or more in Shaanxi province (Wang 1996: 103). This comparison, although not at the same level, still shows a remarkable decline in ideal family size over a period of 12-16 years.

Table 7.3 shows the association between ideal family size preference and women's residence and educational achievement in the 1997 and 2001 surveys. In general, the ideal family size of urban women was lower than their rural counterparts. For all married women, rural women desired 0.25 more children (1.83 and 1.58) than urban women in 1997, and 0.35 more children (1.81 and 1.46) in 2001. These differences were wider among younger married women. The one-child norm has been more accepted by urban women, but two-child preference was still more popular among women in both areas. By the year 2001, for example, one half of all married urban women intended to have one child only, but only 27 percent of rural women wanted one child. Meanwhile, 46 percent of urban women desired two children, but about 65 percent of rural women preferred two children.

As expected, the desired number of children is negatively associated with women's educational achievement. The higher the educational level, the lower the desired number of children. Of younger married women, the desired number of children for those women without schooling was above 1.9 in 1997 and 2001, but it was less than 1.6 for those with educational achievement of secondary school, and high school and above. In addition, both for all married women and for younger married women, the decline in mean desired number of children was more obvious among women with more education, for example, with secondary school and above from 1997 to 2001. But there were no significant changes in family size preference both for women without schooling, including young women.

Table 7.3 Mean desired number of children and percentage distributions of married women who stated that they desired one child, two children, and more than two children by residence and educational achievement in China, 1997 and 2001

Respondents/desired number of children	Mean desired number of children		Desired number of children					
			1		2		3+	
	1997	2001	1997	2001	1997	2001	1997	2001
Married women aged 20-49	(N=11, 750)	(N=32, 797)						
Residence type								
Urban	1.58	1.46	41.3	50.6	54.6	45.6	2.6	1.5
Rural	1.83	1.81	23.9	26.7	68.8	64.6	7.2	8.4
Educational level								
Without schooling	1.93	1.96	17.3	17.4	72.3	68.2	10.4	14.0
Primary school	1.83	1.83	23.7	25.2	69.6	65.8	6.6	8.8
Secondary school	1.68	1.62	35.3	40.1	60.3	56.1	3.9	3.1
High school and above	1.60	1.46	39.4	50.3	56.5	45.9	2.6	1.3
Total	1.77	1.73						
Married women aged 20-29	(N=4, 018)	(N=9, 144)						
Residence type								
Urban	1.50	1.38	49.3	60.9	46.8	36.3	2.5	1.1
Rural	1.75	1.67	30.5	38.2	64.1	57.0	5.3	4.7
Educational level								
Without schooling	1.91	1.94	17.7	18.3	73.0	71.2	9.1	10.0
Primary school	1.77	1.75	28.1	30.4	66.3	64.4	5.6	5.1
Secondary school	1.61	1.51	41.0	50.3	55.0	47.8	3.3	1.6
High school and above	1.51	1.34	48.9	64.7	48.3	32.6	1.9	0.9
Total	1.70	1.61						

Source: Own calculations based on the 1997 and 2001 surveys.

Note: The data on women wanting no children are not shown due to their very small proportions.

It is expected that the family planning program will have less effect on the family size preference of minority women, because most of them are exempt from the family planning program. Women in areas with stronger program performance will experience more program effects than women in areas with more lenient performance. Table 7.4 shows differences in women's ideal family size by ethnic groups and regional difference in program performance. As expected, women of the Han majority tended to have a smaller ideal family size than women of ethnic minorities, with greater differences among younger married women. For example,

the mean desired number of children for younger Han women was 1.68 in 1997 and 1.55 in 2001, while the figure for younger minority women was 1.86 in 1997 and 1.94 in 2001. It is not clear why minority women had an increase in ideal family size from 1997 to 2001, but obviously they were less affected by the program.

Table 7.4 Mean desired number of children and percentage of married women who stated that they desired one child, two children, and more than two children by ethnicity and strength of program efforts in China, 1997 and 2001

Respondents/desired number of children	Mean desired number of children		Desired number of children					
			1		2		3+	
	1997	2001	1997	2001	1997	2001	1997	2001
Married women aged 20-49	(N=11, 750)	(N=32, 797)						
Ethnic group								
Han majority	1.76	1.70	28.8	33.9	65.1	60.0	5.6	5.4
Minority	1.92	1.99	19.3	20.3	69.5	69.9	11.1	9.8
Program efforts								
Advanced	1.64	1.53	39.1	45.6	56.4	52.2	4.1	1.1
Middling	1.84	1.82	21.6	25.7	71.4	65.4	6.6	8.4
Backward	2.02	1.98	10.4	19.4	76.0	60.9	13.2	18.9
Total	1.77	1.73						
Married women aged 20-29	(N=4, 018)	(N=9, 144)						
Ethnic group								
Han majority	1.68	1.55	35.4	45.8	59.8	51.6	4.4	2.2
Minority	1.86	1.94	21.9	22.5	70.0	70.3	8.1	6.9
Program efforts								
Advanced	1.54	1.39	49.1	61.3	47.3	37.9	3.3	0.2
Middling	1.77	1.66	27.4	37.4	67.4	58.9	4.8	3.0
Backward	1.98	1.96	10.9	17.7	78.8	65.8	9.8	16.0
Total	1.70	1.61						

Source: Own calculations based on the 1997 and 2001 surveys.

Note: The data on women wanting no children are not shown due to their very small proportions.

The differences in family size preference between women in regions with different program efforts are very obvious. Both for all women and for younger women, those living in ‘advanced’ areas tended to have fewer desired number of children than those in ‘middling’ and ‘backward’ areas. The differences between the two extremes are very outstanding. For example, of all married women, 39 percent of them in

'advanced' areas preferred one child in 1997, but only 10 percent in 'backward' areas did. Meanwhile, 49 percent younger married women in 'advanced' areas desired one child, while only 11 percent of their counterparts in 'backward' areas did. In addition, except in 'backward' areas, only a small proportion of all women and younger women preferred three or more children. It seems reasonable that the family planning program has affected women's ideal family size. But, 'advanced' areas in family planning were also areas with higher levels of socio-economic development. While the better socio-economic conditions were helpful in program performance, these conditions also contributed to altering women's fertility preferences (Peng 1991b).

The above analysis illustrates the similar trends and distributions of ideal family size for all married women and for younger married women. Thus, the following analysis refers to all married women unless stated otherwise. Table 7.5 presents the ideal family size of women who had at least one surviving child by the number of their children. Since the family planning program is strongly parity-oriented, it is expected that the number of children of a woman has already had could affect her response to the enquiry on family size preference. Of rural women, about 57.5 percent women with one child desired two children in 1997, still 53 percent women with one child still preferred two children in 2001, although 45 percent of them stated preference for one child only. Of those who had two or more children, more than 70 percent of them desired two children. In urban areas, only 45 percent women with one child preferred one child in 1997, but about 57 percent of them considered one child as ideal family size in 2001. For those who had two children or more, at least 70 percent of them desired two children both in 1997 and 2001.

Table 7.5 Percentage distribution and mean ideal family size by the number of children ever born, all married women in China, 1997 and 2001

Residence/number of children ever born	Ideal family size (1997)				Ideal family size (2001)			
	1	2	3+	Mean	1	2	3+	Mean
Rural areas								
1	38.3	57.5	4.0	1.7	45.1	53.2	1.4	1.6
2	15.9	77.8	6.1	1.9	16.4	78.2	5.2	1.9
3+	12.8	74.4	12.8	2.0	11.8	60.6	27.4	2.2
Urban areas								
1	45.0	51.0	2.2	1.5	56.7	40.4	0.5	1.4
2+	23.3	73.2	3.1	1.8	25.3	69.2	0.4	1.7

Source: Own calculations based on 1997 and 2001 surveys.

Notes: Urban women who had more than two children were added to those with two children due to small numbers; childless women are not included due to small numbers.

In general, the 1997 and 2001 surveys show a slight decline in the mean desired number of children in the late 1990s and early 2000s, which had continued since the 1970s (Table 7.6). Moreover, they also indicate an important change towards higher proportions of women who preferred one child. All these findings suggested a narrower gap between the state restriction and public acceptance in terms of the number of children. Undoubtedly, this reduced gap offered a sound foundation for the faster fertility decline in the 1990s.

Table 7.6 Trend of changing ideal family size in China, from the 1970s to early 2000s

Time	Location	Ideal family size	Sources
1970s	Rural areas	3 [a]	Parish & Whyte (1978)
Early 1980s	9 provinces	2 [b]	Whyte & Gu (1987)
Mid-1980s	9 provinces	1.9-3.6	ISI (1991), Wang (1996)
1988-1993	Rural Shannxi	around 2	Greenhalgh (1994)
1992	10 provinces	1.8	Shao (1999)
1997	Nationwide	1.77	SFPC (2000)
2001	Nationwide	1.70	Own calculations

Notes: a. Three children meaning two sons and one daughter; b. two children meaning one son and one Daughter.

However, both surveys show that the stated average family size preference between 1.70 and 1.77 children was higher than the actual fertility in the late 1990s, which was estimated in Chapter 6 to be most likely around the level between 1.5 and 1.6. This does not necessarily weaken its role as corroborating evidence for the far below-replacement-level fertility. Bongaarts (2001: 264) reported that there were differences between ideal family size and actual fertility in many countries, mostly European countries, which had reached very low fertility, but where fertility preference remained above the replacement level. Many studies have come to the same conclusion for several Asian countries with very low fertility, including Thailand, the Republic of Korea and Japan (Choe, Retherford and Kim 2004; Knodel et al. 1996; Ogawa 2003). Therefore, it is reasonable to argue that the decrease in the stated ideal family size reflected the changed attitudes to having children on the one hand, and that fertility declined even faster on the other hand, as experienced in other countries, in the 1990s.

7.3 Effects of ideal family size on whether a woman would stop childbearing with one child

While the previous sections have shown the trend of a continued decline in ideal family size, this section examines the effects of ideal family size on actual fertility. According to the family planning policy, almost all urban and half of rural women are expected to have only one child, the following analysis focuses on whether a woman would have more than one child or whether she would stop childbearing with one child. Since the 1997 and 2001 surveys reflect similar trends and the 2001 survey covers the whole decade of the 1990s, this section and the following section will employ only the 2001 survey data.

In China's family planning program, if a married woman stops childbearing with one child, she will be granted a one-child certificate with certain bonuses either in cash or in materials. Once a woman accepts the one-child certificate, this means she is committed to the one-child policy and will have no more children (Wang 1996). However, there are studies reporting that some women changed their ideas after accepting the one-child certificate. In recent years, because the bonuses from the

one-child certificate have diminished, many women with one child have been reluctant to accept the certificate, even they did not have more children (Cai and Zhang 2000). However, whether a woman accepts the one-child certificate is still an important indicator for measuring women's stopping behaviour with one child. A logistic regression model is applied to examine the effects of ideal family size on women's stopping behaviour with one child, while controlling their demographic and socio-economic characteristics. For binary response variables, the logistic regression model describes how the probability of a particular category depends on the values of independent variables. It can be expressed as the following formula:

$$\boldsymbol{Log\ (P/1\text{-}P)=á+âX} \qquad (7.1)$$

where ***P*** is the predicted probability of a dependent variable according to the values of independent variables. ***(P/1-P)*** is the relative risk, or the odds. While ***á*** is the constant, the value of intercepts; ***â*** is regression coefficient, which represents the change in ***Log (P/1-P)*** for each increase or decrease in *X*.

In the following models, the dependent variable is whether a woman accepted the one-child certificate. Accordingly, all women with one child accepting the certificates are classified as 1, those who did not accept the certificate are classified as 0. The primary independent variable is women's ideal family size. It is hypothesised that the more children a woman desired, the less likely she was to accept the one-child certificate. The controlling independent variables include: (1) residence type, it is expected that urban women were less likely than rural women to have more children; (2) ethnic group, as ethnic-minority women were more likely to have more children than the Han women; (3) educational achievement, it is expected that educational achievement was negatively associated with the number of children ever born; (4) age at first marriage, the earlier a woman married, the more likely that she had more children; (5) sex of first child, it was expected that a woman was more likely to continue to have a second or more children if the first was a girl; (6) timing of childbearing, it is expected that women had their births after 1980 are more likely to have one child; and (7) regional variation in program efforts, as reflected in the SFPC classification of 'three category' regions in the early 1990, it is expected that women in 'backward' areas were more likely than women in 'advanced' and

'middling' areas to have more children. Table 7.7 presents the estimated coefficients and odds ratios of logistic regression models of the effects of ideal family size on actual fertility in 2001.

Table 7.7 Coefficients and odds ratios of logistic regression model of the effects of ideal family size on whether a woman would stop at one child, 2001

Variables	Coefficient ($\hat{a}$)	Exp ($\hat{a}$)
Residence type (Ref=Urban)		
Rural	-1.911***	0.148
Ethnicity (Ref=Minority)		
Han majority	1.125***	3.080
Educational level (Ref=High school +)		
No schooling	-1.945***	0.143
Primary school	-1.395***	0.248
Secondary school	-0.865***	0.421
Ideal family size	-0.701***	0.496
Age at first marriage	0.127***	1.136
Timing of childbirth (Ref=Before 1980)	-0.742***	0.476
Sex of first baby (Ref=Boy)	-0.936***	0.392
Program strength (Ref=Backward areas)		
Advanced areas	1.672***	5.323
Middling areas	0.212**	1.236
Constant	-1.953***	0.142
-2 Log Likelihood	21830.416	
Cox & Snell R^2	0.345	
Nagelkerke R^2	0.512	
Number of cases	N= 31, 272	

Source: Logistic regression model run on the 2001 survey data.

Notes: Excluding cases of women without children and with missing values; *** significant at the level P<0.001; ** significant at the level P<0.01.

It was found that the ideal family size of a woman is statistically significant in affecting the likelihood of her acceptance of the one-child certificate. The higher the desired number of children of a woman, the less likely that she would stop childbearing with one child only. For example, a woman who preferred to have two children would have 50 percent less chances to stop with one child than a woman who desired one child. Accordingly, the lower the desired number of children, the

higher the chances that a woman would stop at one child. This model offers corroborating evidence of the very low fertility in the 1990s, along with the decline in women's ideal family size.

As expected, rural women were 85 percent less likely than urban women to stop at one child. This was related to the lenience of the program performance in rural areas and the higher ideal family size among rural women. The statistical analysis confirms the hypothesis that female educational achievement negatively affected their actual fertility. Women without schooling were 86 percent less likely than women with education of high school or above to stop at one child, while women with primary schooling had 75 percent less possibility and those with secondary school education were 58 percent less likely to do so. The hypothesis of later marriage affecting the possibility to stop at one child is supported. The model suggests that a one-year postponement for a woman at first marriage would increase by 14 percent her possibility of having only one child.

Four variables are closely related to the family planning program. The first is the variable of ethnic group. Since the fertility behaviour of Han majority women was strongly affected by the family planning program, they had three times the chances of minority women of accepting the one-child certificate, or to sop at one child. The second is the timing variable, whether the childbearing occurred after 1980 under the direct effects of the one-child policy. The model shows that a woman who had her first child after 1980 was 52 percent more likely to be committed to the one-child policy. The third variable is the sex of the first child. After controlling other covariates, sex of first child was statistically significant affecting the probability of continuing to have children. A woman with a daughter had 61 percent of the chances of a woman with a son to stop childbearing. The fourth variable reflects the strength of the program efforts. As can be seen in Table 7.7, the likelihood of accepting the one-child certificate for a woman living in 'advanced' areas in terms of the program performance was five times that for a woman living in 'backward' areas. A woman living in 'middling' areas had 24 percent higher probability of accepting the certificate than her counterpart in 'backward' areas.

In general, it was found that the probability of a woman having more than one child was affected by both her socio-economic and demographic characteristics and the program strength in the area where she lived. Nevertheless, other things being equal, the ideal family size is statistically significant in affecting whether a woman will stop at one child. Consequently, the reduction in the mean desired number of children over time undoubtedly contributed to the fertility decline in the 1990s.

7.4 Evidence of son preference from previous studies and two recent surveys

It was widely considered that son preference was strong in China, given its deeply rooted socio-cultural meaning. A number of analyses of fertility behaviour based on the SFPC nationwide surveys reported such evidence. For example, Arnold and Liu (1986) found a relationship between the sex of the preceding child and fertility and contraceptive behaviour based on the 1982 one-per-thousand survey. It was suspected that son preference was closely associated with the increasingly rising sex ratio at birth in recent decades. Using the 1988 two-per-thousand survey data, Poston and his colleagues (1997) reported that it was more likely for a woman who had a daughter to have another child than a woman who already had a son,. Chen (2002) using the 1997 survey data reached a similar conclusion.

However, all these studies started their analyses from the fertility behaviour, in the absence of women's stated fertility preferences. Moreover, when the survey data included questions on fertility preferences, both the In-Depth Fertility Surveys at the provincial level in the 1980s and the two nationwide surveys in the late 1990s and early 2000s failed to provide direct evidence of son preference. In the 1997 survey, of the 3, 313 married women who stated a one-child preference, 66 percent considered that the sex did not matter, 17 percent wanted one boy and another 17 percent wanted preferred one girl. The trend was similar in the 2001 survey. Only 16 percent of the 13, 995 married women who preferred one child clearly stated that they wanted one boy, and 17 percent preferred one girl, while the majority, 67.6 percent of women, considered that the sex composition 'doesn't matter'. Nonetheless, there were differences in son preference between urban and rural

married women. Of all the married women who stated a preference for one child in 2001, 20 percent of rural women desired one boy and 13 percent preferred one girl, while only 13 percent of urban women stated a son preference, but 24 percent wanted to have one daughter. It is possible that once a woman accepted the one-child family norm, she did not care very much about the sex of the only child. Or alternatively, a woman who did not much care about the sex of child was more likely to have a small ideal family size.

Table 7.8 Percentage distribution of desired sex composition for two children, women with at least one surviving child by socio-demographic and regional variables in China, 2001

Respondents	Composition of two desired children				Total cases
	One boy & one girl	Two boys or at least one boy	Two girls or at least one girl	Doesn't matter	
Residence [1]					
Urban	74.5	1.0	1.7	22.8	15, 521
Rural	80.6	1.8	1.0	16.6	3, 520
Ethnic group					
Han majority	79.6	1.6	1.1	17.7	17, 332
Ethnic minority	79.0	2.4	1.2	18.1	1, 709
Educational level					
Semiliterate	82.3	2.5	0.8	14.4	4, 238
Primary school	80.2	2.0	1.0	16.9	6, 637
Secondary school	77.9	1.2	1.3	19.6	5, 975
High school and above	76.0	0.7	1.8	21.5	2, 191
Program strength [2]					
Advanced	70.8	1.3	2.1	25.7	6, 343
Middling	85.2	1.9	0.5	12.3	10, 761
Backward	75.7	1.9	0.9	21.5	1, 937
Total	79.4	1.7	1.1	17.7	19, 041

Source: Own calculations based on the 2001 survey.

Notes: Residence classified by agricultural and non-agricultural *hukou* status; the program strength uses the SFPC definition of three-category region in the early 1990s; Due to Very small proportion stating either two boys or two girls as preference, they were combined together.

Among those women who desired two children, stated son preference was not obvious, either. Table 7.8 shows the percentage distribution of the desired sex

composition of two children of women who had at least one surviving child by their demographic and socio-economic status and the regional variation in program efforts in the 2001 survey. It appears that most women, up to 79 percent, with one surviving child desired one boy and one girl, regardless of their residence type, ethnicity, and educational achievement.

Previous studies argued the presence of strong son preference given the effects of the sex of prior children on the following births (Arnold and Liu 1986; Chen 2002; Poston et al. 1997; Wang 1996). However, it is important to take into account the effects of the family planning policy. The relaxation of rural family planning policy in 1984 has allowed at least half the peasants to have another child ever since. On the one hand, as criticised by some authors, such policy modification was actually 'recognizing and honouring the desire [of peasants] for male children' (Riley 2004: 19). On the other hand, it excludes almost all urbanites and less than half the peasants for having a second child. Given the seemingly dominant two-child preference, it is possible that the some women exhibited their son preference in fertility behaviour.

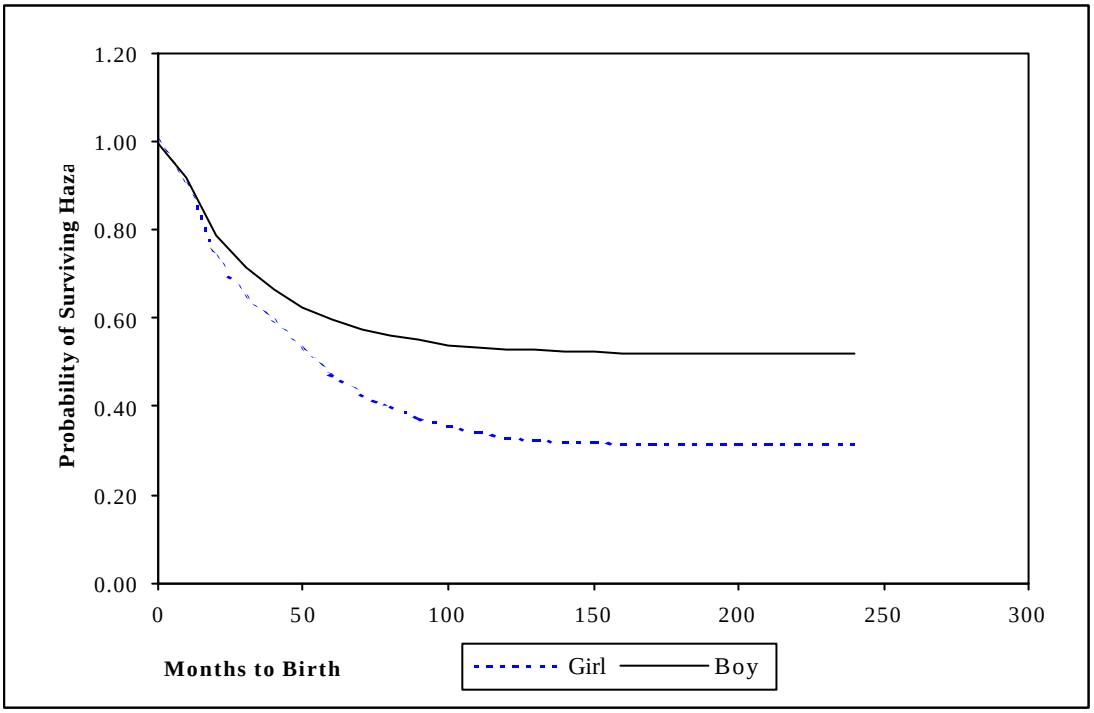
7.5 Effects of son preference on women's transition from one child to a second child

This section examines the effects of the sex of the t child on the probability of women with one child continuing to have another child, in combination with the effects of ideal family size. The analysis is limited to women with one surviving child and examines whether the presence of a female first-born increases the women's chances of transition to a second birth. The survival analysis and Cox partial-likelihood estimation procedure are applied. The model includes all married women who have at least one child, but excludes those women whose first births were twins.

Figure 7.1 shows the probability of a married woman moving from first to second births by the sex of her first child. The survival curve for women with one girl drops rapidly from a probability of nearly 1.0 of surviving the hazard of a second birth after 10-20 months, and levels off from around 150 months to 250 months. At the end,

about 70 percent women with one surviving girl have moved to second births. The survival curve gradually declines and levels off from 100 months to 250 months, and about 40 percent of women with one boy have continued to have another birth.

Figure 7.1 Probability of a woman with one child having a second child by the sex of her first child



Source: Own calculations based on the 2001 survey.

Subsequently, the Cox proportional hazard model is applied to estimate the surviving hazard of transitions from first to second births. The equation to estimate hazard functions is as follows:

$$\log h(t) = \log h_0(t) + b_1X_1 + \ldots + b_k X_k \qquad (7.2)$$

where $h_0(t)$ means any function of time, similar to the constant concept in other forms of regression; X_1 to X_k are covariates, and b_1 to b_k are hazard coefficients to be estimated. In this model, the same independent variables are used as in the logistic regression model in Section 7.3. All these independent variables are time-independent. The dependent variable, ***log h(t)***, is the predicated value of the hazard function at time *(t)*. In this model, it predicates the probability of a woman with one child to have a second one during the period of analysis.

Table 7.9 presents the estimates of the Cox Proportional Hazard model and relative hazards of women with one surviving child to continue to have a second child. All women's demographic and socio-economic characteristics and the factor of program strength are statistically significant covariates in determining the hazard of women moving from first to second births. The most important results are that both a woman's ideal family size and the sex of her first child have positive hazard coefficients. A one-child increase in the desired number of children would have 1.69 times the probability for a woman of having a second birth. Compared to a woman whose first baby was a boy, a woman with a girl has 46 percent higher probability having another birth. This likelihood is net of the effects of other covariates. This suggests that both the desired number of children and the sex composition of prior birth influenced actual fertility under the current family planning policy.

Other findings of the model are consistent with those of the logistic regression model. The hazard of a rural woman having a second birth would be almost three times (2.94) more than that of an urban woman. The Han majority ethnicity would reduce the chances of having a second birth. These two covariates strongly reflect the effects of the family planning program on fertility.

Women's educational level was found to be negatively associated with the hazard of having a second birth. Compared to women educated to high school or above, the lower the educational level, the higher the hazard of moving from first to second birth. However, the later the woman married for the first time, the less likely that she would experience the hazard of having a second birth. But this effect was not very strong. A one-year increase in the age at first marriage would only reduce by 4 percent the hazard of having a second birth, after controlling other socio-economic covariates.

Being consistent with the model in Section 7.3, a woman who had her first birth before 1980 was 73 percent more likely than a woman who had her childbearing after 1980 to have another child. The covariate of regional difference in program efforts covariate is statistically significant in determining the hazard of having a second birth. Obviously, women in both 'advanced' and 'middling' areas were less

likely to move from a first to a second birth than women in 'backward' areas, and women in 'advanced' areas had the least probability of having a second birth.

Table 7.9 Estimates of relative hazard of women with one surviving child to continue to have a second child in China, 2001

Variables		Coefficient ($\hat{a}$)	Exp ($\hat{a}$)
Residence type	(Ref=Urban)		
Rural		1.078***	2.939
Ethnicity	(Ref=Minority)		
Han majority		-0.093***	1.097
Educational level	(Ref=High school +)		
Without schooling		0.837***	2.309
Primary school		0.648***	1.911
Secondary school		0.395***	1.484
Ideal family size		0.526***	1.693
Timing of childbearing	(Ref=After 1980)	0.547***	1.727
Age at first marriage		-0.04***	0.961
Sex of first baby	(Ref=Boy)	0.376***	1.457
Program strength	(Ref=Backward areas)		
Advanced areas		-0.808***	0.446
Middling areas		-0.161***	0.851
-2 Log Likelihood	320, 402		
Chi-square	12, 987		
Number of cases	30, 766		

Source: Cox proportional hazard model run on the 2001 survey data.

Notes: Excluding cases of women without children and with missing values; 13, 797 cases censored; *** significant at the level P<0.001.

In general, this section reveals that the sex of a woman's first child significantly affected her fertility behaviour. A female first birth greatly increased the chance of having another birth, which was confirmed by the survival analysis and the Cox partial-likelihood model. Many authors would consider this as evidence of son preference and indeed it is. However, in the two recent nationwide surveys, only a small proportion of women clearly stated a son preference, while most of them preferred two children, one son and one daughter. Given the important role played by a woman's ideal family size in her actual fertility, the observed effects of son

preference on fertility were most likely to be the combined outcomes of the policy restriction on the number of children and the common two-child ideal family size among most women.

7.6 Underlying causes for changes in fertility preferences

From the information available, a clear trend of decline in family size preference has been identified in the past two decades. On the one hand, more and more women were prepared to accept the official one-child family norm and the average desired number of children was between 1.70 and 1.77 in the late 1990s and early 2000s. All evidence suggested an increasingly narrow gap between the state requirement and popular responses. However, more than half of married women still preferred two children by the early 2000s. Thus, two interesting questions are raised and addressed in this section: (1) why was the two-child preference so common during the past two decades? and (2) what factors contributed to the continued decline in family size preference in the 1990s?

There was no direct evidence of a large family-size-preference among traditional Chinese people. Some old Chinese sayings may reflect such a preference, such as, the 'more sons more happiness' (*duozi duofu*). According to the Buck and Qiao survey around 1930, the earliest reliable evidence, and the 1982 one-per-thousand survey, the average cohort fertility of women was above six children from 1930 to 1970 (Barclay et al. 1976; Coale and Chen 1987). However, more recent studies discovered that deliberate family planning was not an uncommon practice in traditional China (Lee and Wang 1999; Zhao 1997). The dramatic fertility decline during the 1970s suggested the latent demand for fertility control before the nationwide family planning program.

There is evidence that the two-child preference was established in the early 1980s (Feng and Zhang 2002; Greenhalgh, Zhu and Li 1994; Whyte and Gu 1987). Obviously, the family planning program has played an important role in the changes in fertility preferences. In urban areas, the strict family planning program, the high living costs and the housing shortage prevent urbanites from having more than one

child, but there have often been complaints that one child was too few and too lonely. The considerations for children safety and emotional support also make two children appealing for urbanites. Therefore, although many urban women accepted the official one-child norm, still many of them wanted two children, preferably one of each sex.

In rural areas, on the one hand, the less developed economy and no state-sponsored welfare system forced peasants to rely upon themselves. The demand of the family labour force, and the necessity of carrying on the family line, of support in old age and of protection of the family against village bullies made at least one son essential. Daughters were also desired because they provided irreplaceable emotional support, which became even more obvious in the 1990s than in the 1980s (Greenhalgh and Winckler 2001; Zhang 2002). In addition, for the sake of safety, two children provide more assurance than only one child in case that illness or accident could take one off (Greenhalgh 1993). On the other hand, the state family planning program strictly limits the number of children a couple is allowed to bear. Under these circumstances, the two-child preference became the dominant preference of peasants. As Greenhalgh put it:

> The larger socio-economic environment certainly supported small-family norms, but it is unlikely that peasants would have declared only two children as ideal had the state not defined first three, then two, and finally one as the official norm…By embodying state demands in their conscious reproductive aspirations, the peasants were not only accepting, they were also unwittingly reproducing state control over their childbearing (1994: 12).

The effects of the family planning program on ideal family size can be identified in surveys. As discussed earlier, urban women, and women in family planning 'advanced' areas had fewer desired children than those in rural areas and in 'middling' and 'backward' areas in the late 1990s. However, the family planning program was not as powerful and effective in lowering fertility preferences as commonly believed. A detailed literature review concluded that ' although coercive family planning programs might produce change in fertility preferences, the evidence is far from conclusive, even for China…' (Freedman 1997: 11). The persistence of a two-child preference among more than half the married women until the early 2000s also supported this perspective.

Previous studies have established a negative association between ideal family size and many socio-economic variables, including rural-urban residence, educational attainment, mean age at first marriage, and the living standards (Shao 1999; Wang 1996; Whyte and Gu 1987). There was also a cohort shift in family size preference: the younger the cohorts, the smaller the desired number of children (Chen and Zhang 2003). Quite recently, a comparison of women's fertility preference and their reproductive behaviour, using linked data from surveys in four rural counties in Hebei and Shandong province in 1991 and 1994, reported that the acceptance of policy-sanctioned family size followed a development gradient and reflected the degree of enforcement in the family planning program. It was suggested that 'high acceptance occurs in the most urban, industrialized county and in the county with the most rigid family planning policy' (Merli and Smith 2002: 557). Empirically, it is hard to separate the programmatic effects and socio-economic factors on fertility, because women in developed areas normally have higher living standards and educational achievement, and the family planning program has always been stronger benefiting from more socio-economic resources (Greenhalgh and Winckler 2001: 67). Similarly, it is difficult to distinguish the contributions to changing fertility preference from the family planning program and from socio-economic development.

Nevertheless, the rapid socio-economic development during the 1990s was likely of more importance in the slight but continued decline in ideal family size as evidenced in the 1997 and 2001 surveys. Since the early 1980s, the increasing popularisation of the one-child family had contributed to urban parents' focus on creating the perfect offspring, the 'little emperor' (*xiao huangdi*). The rapid development in the 1990s largely created a consumer society in China at least in urban cities. The market force exhibited its principle in every aspect of social life, from the employment structure, the model of life style, the general perception of opportunity, to the attitudes towards children, etc. The improvement in living standard, the influences of public media, and the exposure to outside world induced urbanites to invest more on children to bear 'quality' children for entering into the global economy. Although the 'real' desire for many urbanites may be still two children, the attention on the quality side, especially in health and education of children, probably dampen such preference

among most urban women (Greenhalgh and Winckler in press; Milwertz 1997).

In rural areas, some rural socio-economic policies helped to alter peasants' demands for higher fertility. For example, since the late 1980s the Chinese government has gradually changed the allocation system of rural collective land to peasants, which stipulates that the portion of land is fixed to family members at the original allocation time, and can no longer be changed even if families have new members. This means that the addition of a family member no longer brings extra benefits (Shao 2000). The increasing educational costs helped peasants to change their attitudes towards children. It has been found that Chinese peasants were enthusiastic even in the 1980s about children's education, the most important means for upward social mobility (Greenhalgh 1993; Whyte and Gu 1987). The Compulsory Education Law enacted in 1986 and a number of relevant regulations created during the 1990s ensured the popularisation of primary and secondary school education (Cai and Du 2001; MOE 1998-2003). In the pre-reform era, having many children was considered beneficial in rural areas (Parish and Whyte 1978). However, the increasingly rising costs of education along with the deepened market reform were overwhelmingly considered a huge burden in rural areas (Chu 2001; Greenhalgh, Zhu and Li 1994). This, combined with the popular idea of bearing 'quality' children (Murphy 2004), was very likely reversed parents' attitudes towards children, either voluntarily or involuntarily achieving Caldwell's (1982) transition of 'wealth flow'. Last but not least, as argued in Chapter 6, many peasants, especially young migrant peasants, had already directly experienced the influences of market forces when they worked and lived in urban areas. One study shows that returned migrants, probably one-third of all rural-urban migrants, were leading in changes in reproductive preferences and behaviour (Murphy 2001). These explicitly or implicitly affected younger cohorts in deciding the number of children they desired. These were the underlying causes of increasing numbers of peasants accepting the one-child norm.

7.7 Conclusion

This chapter first reviews the trends of decline in ideal family size over the past three decades, from above two in the mid-1980s to below two in the late 1990s and early

2000s. The recent 1997 and 2001 surveys show a slight but continued decline in the mean desired number of children. More importantly, they report an important shift in women's family size preference towards more acceptance of the officially advocated one-child norm. These findings suggest the increasingly narrow gap between state demands and popular acceptance, which provided a concrete foundation for an accelerated fertility decline to a lower level in the 1990s.

After controlling effects from socio-economic variables and program strength, two multivariate analysis models are applied to examine the effects of fertility preferences on fertility behaviour. The logistic model shows that the ideal family size of a woman is statistically significant in affecting the possibility of her stopping childbearing with one child. The Cox partial likelihood analysis also supports ideal family size as a statistically significant covariate in the hazard of having another child. While most women preferred two children, only a small proportion clearly stated a son preference. It is most likely that the policy restriction on the number of children and the dominant preference fro two children resulted in the son preference embodied in fertility behaviour.

The average ideal family size was still higher than the estimated fertility during the 1990s. However, the experience of many European countries and some Asian countries with very low fertility suggests that fertility could decline further below this level, while the fertility preference was above replacement level. In China, while the stated ideal family size was lower than replacement level, it is most likely that fertility could decline even further given the official promotion of the one-child family and the strength of the family planning program.

Chapter 8 Demographic Components of Fertility Decline: Delayed Marriage and Universal Contraception

This chapter discusses the demographic components of fertility decline in examining the relative effects from proximate determinants. The proximate determinants, or intermediate determinants, are the biological and behavioural factors through which social, economic and cultural factors affect fertility. This idea was first proposed by Davis and Blake (1956) and further developed by Bongaarts and his colleagues (Bongaarts 1978; Bongaarts and Potter 1983), who suggested that four principal proximate determinants play outstanding roles in fertility reduction, namely marriage, contraception, induced abortion and postpartum infecundability. Previous studies have found that marriage and contraception were the major factors in China's fertility decline (Coale 1984; Feeney et al. 1989; Kaufman 1993; Poston 1986; Tu 1995), while induced abortion and infecudability made less contribution (e.g. Chen 2003; Johansson 1995; Qin 1989; Tu and Smith 1995).

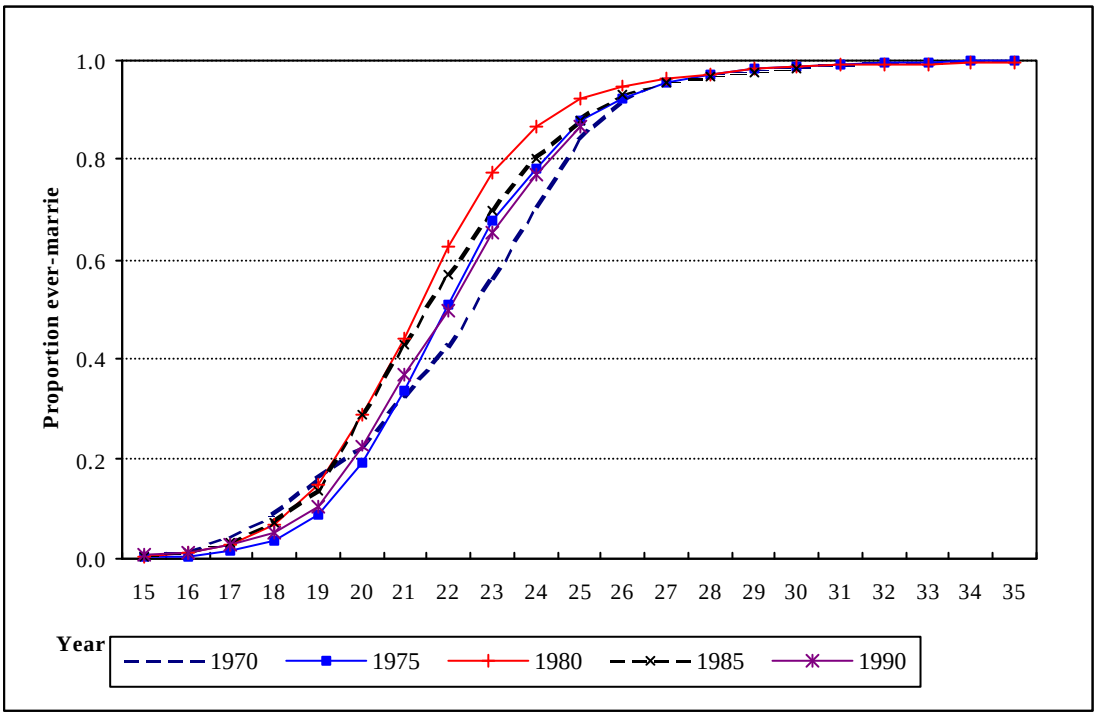
Consequently, this Chapter examines in detail the effects of two proximate determinants of marriage and contraception on fertility reduction, and discusses the other two proximate determinants in general. Section 8.1 describes the trends and patterns of female marriage since 1970; Section 8.2 examines the factors in the increase of female age at first marriage; Section 8.3 analyses the effects of delayed marriage on actual fertility and proposes alternative fertility measures; Section 8.4 introduces the levels and trends of contraception in the 1990s; Section 8.5 reviews the effects of the family planning program on contraceptive patterns; Section 8.6 quantifies the relative importance of proximate determinants using the Bongaarts model; and Section 8.8 concludes the chapter.

8.1 Trends and patterns of female marriage since 1970

Early and universal marriage for females were pervasive practices in traditional China (Coale 1986; Tien 1983). Women married shortly after menarche with a mean

age around 18 and almost all women who survived to age 25–30 had experienced marriage. Lee and Wang (1999: 67) found that the proportion of unmarried females had remained the same throughout the last three centuries. It appears that the pattern of universal female marriage still persists since the founding of the People's Republic. Figure 8.1 shows the proportion ever-married by age 35 for the cohorts of women aged 15 in 1970, 1975, 1980, 1985 and 1990. In all these cohorts, more than 98 percent of women had married by the age of 30 and more than 99 percent in the cohorts reaching age 15 before 1980.

Figure 8.1 Female proportion ever-married by single years of age in China, for cohorts aged 15 in 1970, 1975, 1980, 1985 and 1990



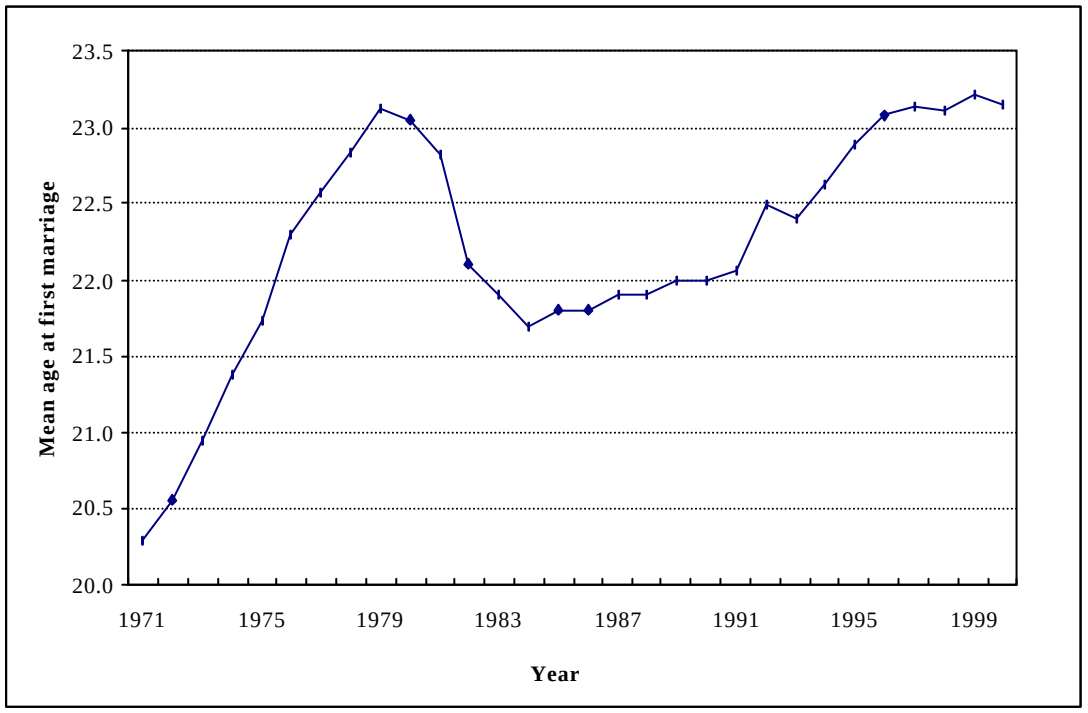
Source: Own calculations based on the 2001 survey.

Note: For the cohort aged 15 in 1990, the proportion ever-married is only accumulated to the age of 26.

There has been an increasing trend of rising female marriage age in the past decades. According to the Buck and Chiao survey of Chinese farmers in 1929-31, the average female marriage age was 17.5 at that time (Barclay et al. 1976). This gradually rose to 18.6 in 1949 according to the 1982 one-per-thousand survey. Shortly after the establishment of the People's Republic, a Marriage Law was promulgated in 1950, which established a marriage system based on the free choice of marriage partners,

monogamy, and equal rights for both sexes (Arnold and Liu 1986). The Law also stipulated the legal minimum age for marriage as 20 for males and 18 for females. During the following decades, the frequency of arranged marriage declined dramatically and marriage became subject to young people's own choices, even though parental consultation or approval is sought in most cases before a marriage is finalised (Wang and Yang 1996). There was a gradual increase in the marriage age from 18.7 in 1950 to 20.2 in 1970, but more rapid change occurred after 1970 when the nationwide family planning program started. Figure 8.2 shows the changes in female mean age at first marriage from 1971 to 2000.

Figure 8.2 Female mean age at first marriage in China, 1971-2000



Source: The 1971-81 series based on the 1982 one-per-thousand survey are from Zhao and Yu (1984: 125); the 1982-87 series are based on the 1988 two-per-thousand survey; the 1988-92 series are based on the 1992 survey are from Lin (1994: 10); and the 1993-2000 series are own calculations based on the 2001 survey.

During the 1970s, there was a dramatic rise in the female mean age at first marriage from 20.3 in 1971 to 23.1 in 1979, on average an annual addition of one-third of a year. This rise was closely related to the 'later, longer, fewer' family planning campaign (Coale 1984), of which the promotion of late marriage was an important component. Despite the legal minimum age set in the 1950 Marriage Law, the family

planning program strongly urged urban women to get married after 25 and rural women after 23. To complete the marriage registration, the groom and bride had to obtain permission from their heads of working units in cities or of brigadea in villages (Tien 1983). illions of urban young people, who were rusticated during the period of the Cultural Revolution from 1966 to 1976, had to delay their marriage due to practical difficulties.

However, the mean female marriage age declined in the early 1980s, falling from 23.1 in 1980 to 21.7 in 1984, and then gradually increasing to 22.0 in 1990. Even for urban women, the mean age declined from 25.2 in 1980 to 23.6 in 1990. This was closely related to changes in law and government policies. In 1980 a new Marriage Law was promulgated, which increased the minimum legal marriage age from 18 to 20 for females and from 20 to 23 for males. However, in practice, the new law abolished the *de facto* restriction on age at marriage imposed by the family planning program in the 1970s. Consequently, a large number of young people who delayed their marriage in the 1970s, and the large cohorts born in the 1960s who had just reached marriageable age, entered into union together, resulting in a marriage boom in the 1980s with on average 11 million marriages each year. The rural reform, the implementation of household responsibility system relying on family labour force, further promoted young peasants to get married early (Zeng 2000). In addition, relaxation of the family planning policy in 1984 practically promoted large numbers of young peasants who wanted several children to hurry into marriage for fear of further policy change.

In the 1990s, the Chinese government recognised the importance of late marriage in the family planning program and also took the necessary measures to promote late marriage. According to most provincial family planning regulations, the late marriage age was defined as 23 for females and 25 for males (Feng and Hao 1992). In late 1992, The Ministry of Civil Affairs, the SFPC and other five Ministries jointly issued a directive requiring all departments concerned to strengthen the management of marriage registration, in order to curtail the early marriage and early childbearing (Peng 1997). Meanwhile, the economic take-off and the large-scale rural-urban transformation greatly altered people's aspirations and lifestyles. Consequently, more and more young urbanites and rural migrants postponed their marriage, which

resulted in a rise in female marriage age again reversing the declining trend in the early 1980s. Both the SSB annual surveys and the SFPC retrospective surveys reported the increase in female mean age at marriage over the course of the 1990s with slight variation. According to the 1992, 1997 and 2001 SFPC surveys, the female mean age increased from 22.2 in 1991 to 22.9 in 1995 and further to 23.2 in the year 2000.

An alternative measure is the female singulate mean age of marriage (SMAM) derived from censuses, the average age at first marriage computed from the proportions never married by age (Hajnal 1953). Although this estimate corresponds to a more recent time-period than those estimated from retrospective surveys, it is assumed that the first marriage rate has been constant over time. If rates have been changing, the value of SMAM is a hodge-podge of rates in the recent and distant past (Preston, Heuveline and Guillot 2001: 89). Table 8.1 presents the SMAM calculated from the censuses and sample censuses from 1982 to 2000. Although these census-estimated series were slightly higher than those estimated from surveys, they were still in close agreement in reflecting the trend of rising female marriage age.

Table 8.1 Singulate mean age at marriage (SMAM) for females in China, in the years of census and sample census from 1982 to 2000

Year	Source	SMAM
1982 [1]	Census	22.4
1987 [2]	Sample census	22.2
1990 [1]	Census	22.1
1995 [1]	Sample census	22.6
2000 [3]	Census	23.3

Sources: The 1982, 1990 and 1995 figures are from Lee and Wang (1999: 67); the 1987 figure id from Zeng (2000: 93), the 2000 figure is own calculation based on the census tabulations.

8.2 Factors affecting postponement of marriage in the 1990s

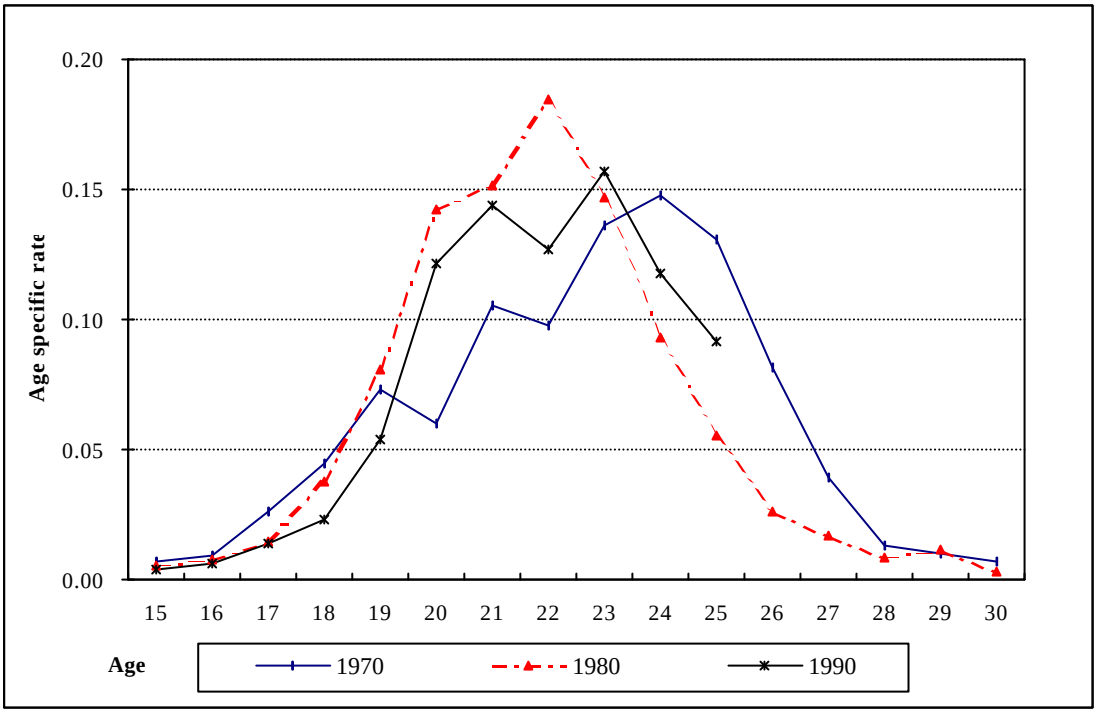
The age at which a woman marries is greatly affected by her socio-economic characteristics. The marriage age of urban women has always been higher than that of their rural counterparts. This is closely related to the fact that urban women have

more opportunities for education and employment. For urban women, more education means more time in school and hence better opportunity in employment. For rural women, more education brings higher aspirations and more chances to migrate to cities. Ethnicity also has effects, as women in the Han majority tend to marry later than minority women. However, since the nationwide family planning program started in the early 1970s, it has also had major effects on female marriage age. This was especially the case in the 1970s (Coale 1984). The new Marriage Law and policy relaxation in the 1980s provided another example.

Figure 8.3 shows the age-specific rates of first marriage in three cohorts, which reached age 15 in 1970, 1980 and 1990, and hence mainly entered into marriage in the three following decades. As can be seen, for the cohort of women who were aged 15 in 1970, who began entering marriage after the 'later, longer, fewer' campaign was introduced, there were fewer marriages at ages under 20 but more after the age of 23. The peak age of marriage was 23, the program promoted later marriage age. The two cohorts who married in the 1980s and 1990s after the relaxation of the minimum legal marriage age in 1980, both had fairly smooth sequences of marriage rates with fewer marriages at earlier age (under 18) and more at higher ages (over 21). As suggested by Coale and his colleagues (1991: 392), this kind of marriage pattern is what one would expect when later marriage is the effect of general socio-economic changes. It is clear that the marriage experience of the cohort aged 15 in 1970 was affected by the government intervention, while the two later cohorts were more likely the effects of general socio-economic changes.

During the 1990s, there was an addition of 0.1 year in female marriage age each year. The increase in marriage age was accompanied by the rapid economic development, improvements in educational achievement and large-scale rural-urban transformation. There was little for the governments to do to raise marriage age in the absence of necessary measures after 1980, except for restricting early marriage (Lin 1994). It is likely that women's socio-economic characteristics were more important in determining their timing to enter into a sexual union.

Figure 8.3 Female first marriage rates in China, cohorts aged 15 in 1970, 1980 and 1990



Source: Own calculations based on the 2001 survey.

To better understand the circumstances affecting of female marriage, the Cox partial-likelihood method is applied using the 2001 SFPC survey data. A brief introduction to the Cox proportional hazard models has been presented in Chapter 7. The model estimates the relative hazards of a woman moving from her birth to her first marriage, after controlling her socio-economic characteristics, including her place of residence, ethnicity, educational level, and the region to which she belongs. The programmatic variable uses the SFPC definition of 'three-category' regions, namely 'advanced', 'middling' and 'backward', primarily reflecting strength of policy enforcement in family planning. As women who married in the 1970s were significantly affected by government intervention, this model includes only the cohorts of women who were born after 1970 and largely married after the mid-1980s, several years after the publicity for the 1980 Marriage Law. As a result, 29, 510 women are included in the model, of which 6, 440 were censored because they were still unmarried at the survey date. Table 8.2 presents the estimated relative hazards of a woman entering her first marriage.

Table 8.2 Estimates of relative hazards of a woman entering her first marriage in China, 2001

Variables	Coefficient	Sig.	Exp (B)
Residence type (Ref=Urban)			
Rural	0.295	***	1.343
Ethnicity (Ref=Minority)			
Han majority	-0.074	**	0.929
Educational level (Ref=High school +)			
Without schooling	0.834	***	2.363
Primary school	0.741	***	2.098
Secondary school	0.464	***	1.591
Regional difference (Ref=Backward areas)			
Advanced areas	-0.085	***	0.919
Middling areas	-0.054	*	0.947
-2 Log Likelihood	421690		
Chi-square	3097		
Number of cases	29, 510		

Source: Cox proportional hazard model run on the 2001 survey data.

Notes: 6, 440 cases of still unmarried were censored; *** significant at the level P<0.001;

** significant at the level P<0.05; * significant at the level P<0.01.

For all women born after 1970, all their socio-economic characteristics and regional factors were statistically significant in affecting the age of entering marriage. Rural women were more likely to marry earlier than urban women. Educational achievement was found to be significant in determining the marriage timing. Compared to women educated at the high school level or above, both women without schooling and women with primary education had twice the chances of earlier, while women with secondary school qualifications were somewhat more likely to marry earlier. As expected, women in the Han majority were less likely than minority women to marry early (P<0.01). It was found that the programmatic factors, primarily reflecting the strength of the family planning program, were significant, and early marriage was less likely for women in areas with strong program performance.

In general, the female mean age at first marriage increased gradually over the course of the 1990s. Different from the 'artificial' increase in the 1970s from government pressure, this postponement was the effect of both general socio-economic changes

and the family planning program. However, it appears that differences in socio-economic characteristics have been more closely related to the difference in the timing of a woman entering marriage.

8.3 Effects of delayed marriage on fertility in the 1990s

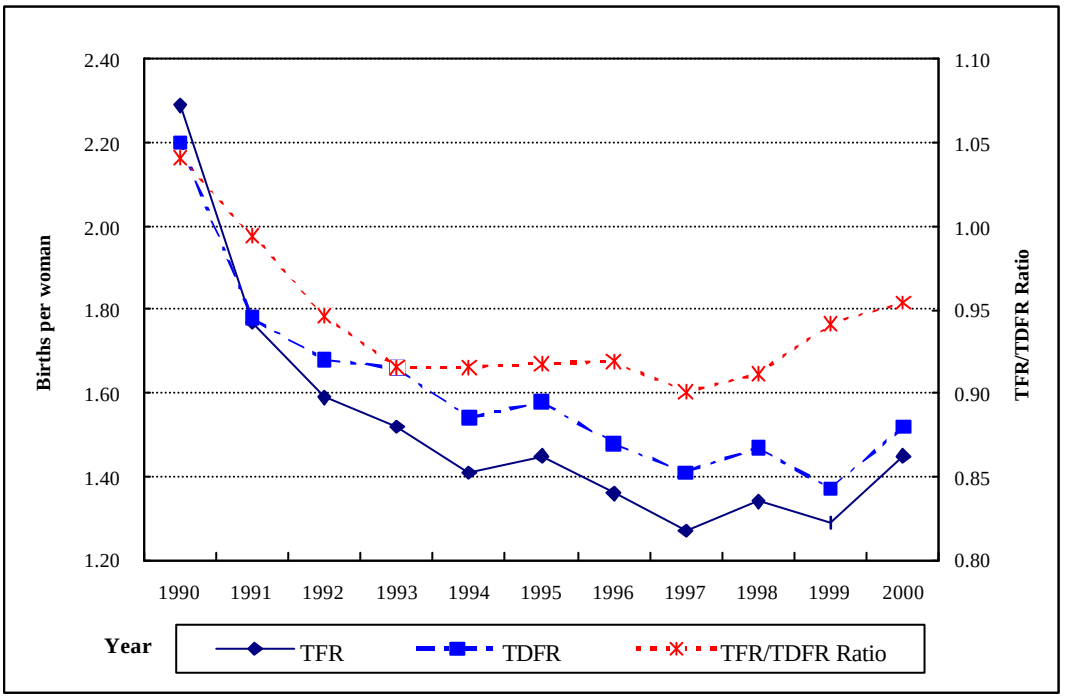
In a population like China with negligible non-marital fertility and practicing contraception within marriage, changes in age at marriage also change the timing of births for each cohort of women. As a result, a postponement of childbearing caused by later marriage produced a temporary reduction in period fertility even if cohort fertility is not changed, as illustrated by China's demographic experience in the 1970s (Coale 1984; Coale et al. 1991; Feeney et al. 1989). During the 1990s, the female marriage age rose again, which can be expected that the same mechanism would exert influence in the decline of fertility.

In a number of analyses on China's fertility, Coale and his colleagues (Coale 1984; Coale 1989; Coale et al. 1991) suggested that the total duration-specific fertility rate (TDFR), the sum of fertility rates of ever-married women at each duration since their first marriage, was a more robust measure than the conventional TFR resistant to the changes in age at first marriage. This is because that the TDFR records the average number of children that would be borne by a group of newly married women, assuming that they would experience the fertility rate at each duration of marriage in a given period, and the changes in marriage age does not affect the childbearing after marriage. As virtually almost all Chinese women were married, Coale (1989: 839) suggested that the ratio TFR/TDFR is 'a measure of the effect of recent changes in nuptiality on overall fertility'. There was a close relationship between this ratio and the changes in marriage: when the mean age at marriage has increased, the ratio is below 1; and when the mean marriage age is decreasing, the ratio is above 1.

Figure 8.4 shows total fertility rates and total duration-specific fertility rates from 1990 to 2000 calculated from the 2001 survey. Except in the year 1990, the TFR was less than TDFR over the course of the 1990s; the ratio was also below 1 during the same period, clearly suggesting the effect of rising marriage age on fertility. The

TFR/TDFR ratio also provides an estimate of the increase in the number of births occurred if marriage age had remained constant. Multiplying the TFR/TDFR ratio by the number of births, Coale and his colleagues (1991: 391) estimated that about 19 percent of reduction in births, or 53 million births, from 1971 to 1980 resulted from the rising marriage age. Using the same approach, Lin (1994: 19) estimated that about 3 percent increase in births in the first half of the 1980s was attributed to the decline in marriage.

Figure 8.4 Total fertility rates and total duration-specific fertility rates, and the TFR/TDFR ratios in China, 1990-2000



Source: Own calculations based on the 2001 survey.

According to the 2001 survey, the TFR/TDFR ratio from 1991 to 2000 was on average 0.93, implying 7 percent fertility reduction resulting from delayed marriage. In Chapter 6, this thesis estimated the total number of annual births during this period was 191.86 million (column 6 in Table 6.5). If marriage age and the duration-specific fertility rates since first marriage did not change, there would have been an additional 13.4 million births from 1991 to 2000.

Although delayed marriage played an important role in fertility reduction in the 1970s, this was not recognised by the policy makers in the early 1980s when revising

the Marriage Law (Coale 1989; Feeney et al. 1989). In the early 1990s, demographers strongly advocated: "Should China then restudy the 'three character bible' of *'Wan, Xi and Shao'* (later, longer, fewer) and better understand relation between the period and cohort effects of fertility, if further decline of fertility is desired?" (Gu 1994: 19). Fortunately, the SFPC and other government departments concerned undertook some measures in this aspect, although not powerful as in the 1970s, which was supplemented by the effects of general socio-economic development. Consequently, the 1990s saw important contributions from delayed marriage to period fertility reduction, which was important in China.

8.4 Levels and trends of contraception in the 1990s

Since the early 1970s, the Chinese government has made great efforts in establishing a nationwide infrastructure for the delivery of contraceptives for married couples free of charge. Sterilisation, IUD insertion and abortion services were provided through the primary health care system at village, township and county health institutions; oral contraceptives and barrier methods were provided through a community-based distribution system (Kaufman et al. 1992a: 18). No reliable data were available about the contraceptive prevalence level in the 1970s, but the practice of contraception among married couples undoubtedly contributed to the dramatic fertility decline in the 1970s.

After the implementation of the one-child policy, the Chinese government attached more importance to contraception. According to the 1982 one-per-thousand survey, 69.4 percent of women of reproductive age were using contraceptives by the early 1980s (Poston 1986). In 1983, the SFPC proposed the slogan 'three priorities' (*san weizhu*) in the program implementation, namely 'giving priorities to information, education and communication, to contraception and to regular service in family planning work', based on the experience of a model county in Shandong province, (Chang 1992: 8; SFPC 1995). The SFPC began to establish an independent service delivery system starting from the early 1980s. By 1992, township family planning service stations had been created in more than 2000 of the total 2, 825 counties in China (Kaufman et al. 1992a). To better meet the program target, long-term and

provider-controlled contraceptives were heavily promoted. Meanwhile, both for cultural and health reasons, women were the major program subjects. According to the provincial family planning regulations in 14 provinces enacted around 1990, women were expected to have an IUD inserted after having one child, and one member of couples after having two children was expected to bee sterilised (Feng and Hao 1992). Official permission was required for method switch, which was allowed only under the condition that users suffered from unacceptable side-effects.

In the early 1990s, the program further strengthened the requirement of contraception. In rural areas, the contraceptive status of women was monitored thorough monthly household visits by a women's group leader and quarterly examinations at the township family planning service station. Starting from the mid-1990s, the Chinese government began to emphasise 'informed choice' and 'Quality of Care' in service delivery, partly in response to the ICPD recommendations, and partly due to the reduced pressure from rapid population growth (Gu 2000; Zhang et al. 1996). The program re-orientation was first piloted in some counties in eastern provinces and then was expanded to one-third of areas by the late 1990s, mostly in eastern and middle China (Government of PR China 2002). This innovative approach offers reproductive couples a choice in contraceptive methods with counselling and follow-up service, in contrast to the requirement of IUDs after the first birth and sterilisation after the second. As shown in the 2001 survey, there was evidence for a decline in the proportion of sterilisations and an increase in IUD insertions and condoms. Nevertheless, the prerequisite for such a limited choice is that all women must practise contraception after having the allowed number of children (Gu, Simmons and Szatkowski 2002; Winckler 2002).

The common measure to reflect the contraception level is the contraceptive prevalence rate (CPR), which is the percentage of married women aged 15-49 who are using, or whose partners are using, any form of contraception, whether modern or traditional. In the official family planning statistics in China, the contraceptive prevalence rate was very high, more than 90 percent in the 1990s (SFPC 1991-2002). This was partly because local family planning cadres tended to overreport the figures of contraceptive users, and partly because in the program statistics the SFPC often omitted from the denominator women whom the program does not require to practise

contraception, such those who were widowed, separated or past menopause. However, more reliable contraceptive data came from the series of retrospective surveys, which directly enquired into women's histories of births and contraception. Based on these surveys, an international comparable CPR can be estimated. Table 8.3 presents the contraceptive status of all married women aged 15-49 at the survey time from 1982 to 2001. There was an increase in CPR among married women from 69.4 percent in 1982 to 86.9 percent in 2001. A large proportion of non-users comprised those who did not need to practise contraception, such as those pregnant or waiting for pregnancy, separated or widowed, or infecund. Therefore, the real non-users were a very small proportion of married women aged 15-49, declining from 4.9 percent in 1988 to 2.3 percent in 2001.

Table 8.3 Contraceptive status of married women aged 15-49 in China, 1982-2001

Year	Proportion currently married (percent)	Contraceptive prevalence rate (percent)	Reasons for not practising contraception	
			No sex life (percent)	Fear of side effects or unavailability of methods (percent)
1982	68.5	69.4	N.A.	N.A.
1988	70.4	71.2	23.9	4.9
1992	73.5	83.4	13.3	3.3
1997	80.9	85.3	12.0	2.7
2001	82.0	86.9	10.8	2.3

Source: The 1982 figures are from Poston (1986), others are own calculations based on the 1988, 1992, 1997 and 2001 surveys.

Note: The reasons for not using contraception because of 'no sex life' included being separated, sterile, ill, breastfeeding or pregnant, or waiting for pregnancy.

Table 8.4 presents the CPRs of selected countries during the period from 1995 to 2002. The left column provides the figures from seven developed countries with very low fertility, while the right column presents the figures from countries in East and Southeast Asia. It appears that China, together with the UK, had the world's highest contraceptive prevalence rate. Compared to other Asian countries with low fertility, contraception was more common among married women in China.

Table 8.4 Contraceptive prevalence rates (CPR) of married women aged 15-49 in selected countries, 1995-2002

Country	CPR (percent)	Country	CPR (percent)
UK	84	China	84
Spain	81	Korea, Rep. of	71
USA	76	Viet Nam	78
Canada	75	Thailand	72
Italy	60	Singapore	62
Japan	56	Indonesia	57

Source: These figures are from the United Nations (2004).

Note: Data refer to the most recent year available during the period specified (1995-2002).

8.5 Family planning program and contraceptive patterns

The high CPR value was certainly the result of the family planning program. The effects of the family planning program on contraception were not only embodied in the nearly universal practice of contraception, but also in the promotion of long-term contraceptive methods, and the timing of practicing contraception. The parity-specific family planning program also resulted in the parity-specific characteristics of contraceptive distribution. On the other hand, individuals also played a role in the choice of contraceptive methods, which was more obvious in urban areas than in rural areas, and was more apparent in recent years than earlier years.

Table 8.5 shows the percentage distribution of contraceptive methods used among married women from 1988 to 2001. It is clear that the most commonly used methods were sterilisations, mainly female sterilisations, and intra-uterine devices (IUDs). These methods were provider-controlled and long-term effective methods and were promoted both by some provincial regulations and by local service deliverers (Greenhalgh 1994; Kaufman et al. 1992b). During the period from 1988 to 2001, sterilisations for males and females made up more than 45 percent of all contraceptive methods used. But the proportion using male sterilisations gradually declined over time with its unpopularity in China. It was suggested that probably ‘in this male-centred culture, the balance of decision making power favours husbands over wives’ (Greenhalgh and Winckler 2001: 8). Meanwhile, there was a slight

increase in the proportion using IUDs, from 41.5 percent in 1980 to 45.6 percent in 2001. It was very likely related to the SFPC decision to switch from the unreliable steel-ring IUD, which had a high occurrence of failure, to the more reliable Copper-T IUDs in the early 1990s (Kaufman 1993; Tu 1995). Other studies found that women tended to choose long-term effective IUDs over short-term pills or condoms once they had the limited choice in methods in SFPC-piloted areas, given their essentially improbable chances of having more children (Gu, Simmons and Szatkowski 2002). It is interesting to see that there was a slight increase in the use of condoms over time, probably due to the increased choice for couples. An alternative explanation was the increasing use by more sexually active young adults.

Table 8.5 Percentage distribution of currently used contraceptive methods among married women aged 15-49 in China, 1988-2001

Contraceptives used	1988	1992	1997	2001
Male sterilisation	11	11.8	9.2	7.9
Female sterilisation	38.2	41.6	40.0	38.1
IUDs	41.5	40.1	43.4	45.6
Pills & injections	4.9	3.8	2.2	2.4
Condoms	2.7	1.8	4.1	5.1
Others	1.7	0.9	1.1	0.9
Total	100	100	100	100

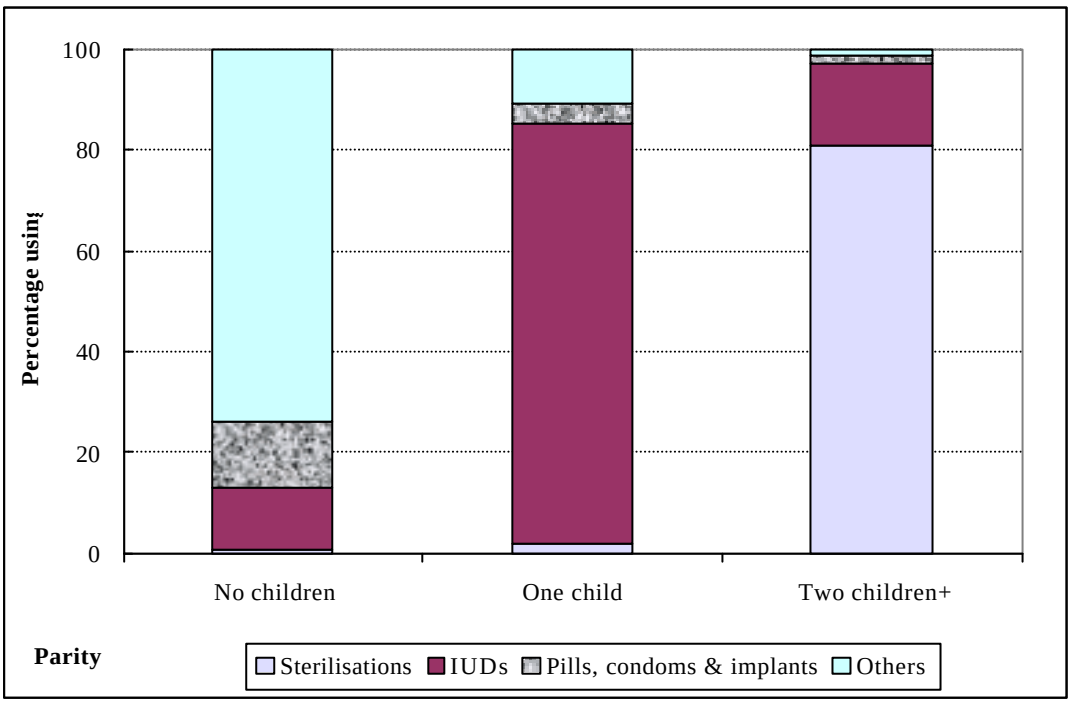
Source: Own calculations based on the 1988, 1992, 1997 and 2001 surveys.

Notes: The contraceptive users include those whose husbands use contraception; other methods include rhythm, withdrawal and traditional methods.

The timing when a woman practised contraception and the methods she used were found to be closely related to her parity. The 1997 survey provides the timing information for women's practice of contraception. It was reported that only 8.3 percent of women practiced contraception before having the first child, but 56.5 percent used contraceptives after bearing the first child, and 34.1 percent after the second. The type of contraceptive methods used by women differed considerably by parity. Figure 8.5 presents the percentage distribution of contraceptive methods used, by the parity of married women in 2001. Only one-fourth of contraceptive users without children, about 8.3 percent in 1997, used IUDs or pills and other short-term methods, while the majority stated 'others', probably no methods. However, more

than 80 percent of women with one child had IUD insertions, and only 10 percent of women were sterilised. But about 81 percent of women with two or more children were sterilised. This was primarily the result of the family planning program. However, it did not exclude other factors. For example, most urban women had only one child, but 90 percent of them used IUDs in 2001; the majority of rural women had two or more children, and more than 80 percent of them were sterilised.

Figure 8.5 Percentage distribution of contraceptive methods used among married women aged 15-49 by parity in China, 2001



Source: Own calculations based on the 2001 survey.

A multivariate analysis is applied to examine the effects of the family planning program on women's use of contraceptive methods, after controlling their demographic and socio-economic characteristics. For married women with at least one surviving child, the methods used can be classified into three main categories, namely sterilisations, IUDs and other methods. Accordingly, this study uses the multinominal logit model to estimate the covariates of program effects on women's contraceptive methods, which allows the dependent variable to have more than two possible outcomes (Choe 1989; Choe and Tsuya 1991; Hoffman and Duncan 1988). The model is a generalisation of the binary logistic regression model, which has been introduced in Chapter 7.

Because most Chinese women have completed childbearing by the age of 35, this model only includes married women aged under 35. The dependent variable used in the model is a three-category variable: (1) a woman has been sterilised; (2) a woman is using an IUD; and (3) a woman is using other short-term contraceptives. Given the different contraceptive requirements between women with one child only and women who have had two or more children, two models are estimated separately according to women's number of surviving children. The covariates contain three types of variables: (1) women's demographic variables, mainly the duration of marriage, and the sex of first child, (2) socio-economic variables, including women's residence type, ethnicity and educational achievement, and (3) variables representing the programmatic strength, the SFPC's classification of three-category regions in program performance.

Table 8.6 presents the estimated percentage of each covariate of women's use of contraception by the number of their surviving children, because the interpretation for the coefficients and odds ratios of the multinominal logit model is very difficult. Estimated percentages are computed by using mean values for all covariates, and separately for women with one child and those with more than one child (see Choe 1989; Choe and Tsuya 1991).

It appears that there are two different patterns of contraceptive use between women with one surviving child only and those with two or more surviving children. Of women with one surviving child, 86 percent used the long-term but reversible IUDs while some chose short-term methods, such as pills, condoms, or injectables. Because only a little over one percent of women with one surviving child were sterilised, the following analysis focuses on IUD users. Woman's residence type, educational achievement, marriage duration, and regional location were found to be statistically significant covariates in their contraceptive method choice. Urban women and women with high school and above education were more likely to use other user-controlled contraceptive methods than rural and lower-educated women, who mainly used provider-controlled IUDs. Similarly, women in areas with 'advanced' program performance tended to rely less on long-term methods than those in other areas. In addition, the longer a woman had been married, the more

likely she was to use IUDs, or was sterilised, probably because these women had completed their childbearing task. Ethnicity was not a statistically significant covariate. Whether the first child was a boy was not statistically significant in affecting women's contraceptive choice, because the family planning program emphasised birth spacing in the 1990s, and required women to wait for several years with IUD insertions, even if permitted to have another child.

Table 8.6 Estimated percentages of currently married women aged under 35 using contraceptives by the number of surviving children in China, 2001

Covariates	Percentage distribution					
	Surviving children=1			Surviving children>1		
	Sterilizations	IUDs	Others	Sterilizations	IUDs	Others
All women	1.1	86.4	12.5	76.0	20.1	3.9
Residence						
Urban	2.0	37.2	60.8	65.1	27.8	7.1
Rural	3.6	60.9	35.6	79.9	17.2	2.9
Ethnicity						
Han	n.s.	n.s.	n.s.	83.0	14.5	2.5
Minority	n.s.	n.s.	n.s.	47.7	44.4	7.9
Had high school+ education?						
High school+	1.6	42.4	56.0	79.2	17.7	3.0
Others	3.6	56.6	39.8	65.6	24.5	9.9
Marriage duration						
5 years	2.3	52.1	45.6	61.8	31.7	6.5
10 years	6.8	58.7	34.4	78.2	18.6	3.3
15 years	17.8	59.0	23.2	88.8	9.8	1.5
Male surviving children?						
Yes	n.s.	n.s.	n.s.	-	-	-
No	n.s.	n.s.	n.s.	-	-	-
Good program performance?						
Advanced	1.8	50.8	47.4	54.4	38.3	7.2
Others	4.8	56.3	39.0	83.3	14.3	2.4

Source: The multinomial logit model is run based on the 2001 SFPC retrospective survey.

Notes: n. s. = not significant; - = not included in the model; t he computation method of estimated percentage is from Choe and her colleagues (Choe 1989; Choe and Tsuya 1991).

Women with two or more surviving children behaved differently in contraceptive use. While the majority of them, 76 percent, were sterilised, about 20 percent used IUDs and a small proportion used short-term methods, probably for health reasons. Women's residence, ethnicity, education, marriage duration and regional location were all found to be statistically significant covariates. The longer a woman had been married, the more likely that she was sterilised. Women in ethnic minority groups were far less likely to be sterilised than Han women, due to the lenient family planning policy applied with ethnic minorities. Rural women were more likely to be sterilised than urban women; but only a very small proportion of urban women were allowed to have two children. The family planning program in 'advanced' areas was less likely to rely upon permanent contraceptive methods, and permitted more women to use long-term but reversible methods. This was related to the fact that the program reorientation in the 1990s, which offered women certain choices in contraceptives, mainly occurred in advanced areas.

In general, whether and when a married woman practised contraception, and what methods she would use are strongly affected by the family planning program. The program strengthening after 1991 greatly increased the contraceptive prevalence rate among currently married women, reaching an extent of nearly universal contraception in the 1990s and early 2000s. This combined with the improved contraceptive effectiveness greatly contributed to the continued fertility decline in the 1990s.

8.6 Quantification of contributions of marriage and contraception using the Bongaarts model

This section quantifies the relative importance of marriage and contraception as proximate determinants in the fertility reduction employing the Bongaarts model. Although there are a number of alternative approaches or revisions of the Bongaarts model (e.g. Hobcraft and Little 1984; Stover 1998), for the purpose of this research and in the Chinese context, the Bongaarts model is considered the best choice, which can be expressed as the following formula (Bongaarts and Potter 1983):

$$TFR=C_m*C_C*C_i*C_a*TF \quad (8.1)$$

where TFR is the total fertility rate, C_m is the index of marriage; C_C is the index of contraception; C_i is the index of postpartum infecundability; C_a is the index of abortion; and *TF* is total fecundity. The four indices measure the fertility-inhibiting effects of the proximate determinants of marriage, contraception, postpartum infecundability and induced abortion. Their values range from 0 to 1, of which 0 indicates a complete fertility inhibition, while 1 no effect. Therefore, the lower the value of the index, the greater the fertility-inhibiting effect of the variable from its potential maximum level. The total fecundity refers to the maximum potential fertility for a woman in the absence of all fertility-inhibiting effects. According to Bongaarts, the value of total fecundity ranges from 13 to 17 children per woman, with an average of 15.3 births per woman (Bongaarts 1982: 118). Many previous studies suggested that the total fecundity in China is 17.01 (Gao, Chen and Gu 1989; Qin 1989), which is also assumed in this study. Table 8.7 presents the values of four proximate determinants in 1990 and 2000, calculated based on the 2001 survey data.

Table 8.7 Estimates of indices of proximate determinants of fertility and decomposition of the change in total fertility in China, 1990 and 2000

Indices of proximate determinants	1990	2000	Distribution of percentage change in total fertility from 1990 to 2000
C_m	0.579	0.512	-11.6
C_c	0.336	0.267	-20.5
C_a	0.731	0.769	+5.2
C_i	0.816	0.816	0
Combined effects	0.116	0.086	
TF	17.01	17.01	
TFR (estimated)	1.97	1.46	-25.9

Source: Own calculations based on the 2001 survey.

Note: The decomposition of the total fertility rate into its components was made using the following formula (Bongaarts and Potter 1983: 107-108): $P_t=(TFR2000/TFR1990-1)$; $P_m=(C_m2000/C_m1990-1)$; $P_c=(C_c2000/C_c1990-1)$; $P_i=(C_i2000/C_i1990-1)$; and $P_a=(C_a2000/C_a1990-1)$.

C_m is the index of proportion married, which measures the extent by which TFR is smaller than total marital fertility (TM) as a result of non-marriage. As discussed in

Section 8.1, universal female marriage was still the practice in the 1990s, though with an increasing trend of late marriage. The incidence of divorce and widowhood was still low, about 2 percent of ever-married women aged 15-49 in 2001. Thus the change of C_m value mainly represents the effects of marriage postponement. As can be seen, the C_m declined from 0.58 in 1990 to 0.51 in 2000, indicating that the marriage postponement contributed 42-49 percent of fertility reduction in 1990 and 2000.

C_c is the index of non-contraception. China's CPR was very high and actually there was a very small proportion of non-contraceptive users among fecund married women. In addition, the majority of contraceptive methods used were long-term methods. Although there were reports of the low effectiveness of the widely used steel-ring IUDs in the 1980s and early 1990s (Kaufman 1993), it is expected that the switch to Copper IUDs and the emphasis on 'Quality of Care' would improve the overall effectiveness of contraceptives, which was confirmed by recent surveys. Taking into account the improvement of use-effectiveness of IUDs, the estimated values of overall contraceptive effectiveness were 0.769 in 1990 and 0.799 in 2000. As a result, the estimated values of C_c were 0.336 in 1990 and 0.267 in 2000, respectively, suggesting that contraception contributed 66-73 percent to fertility reduction during the 1990s.

C_a is the index of induced abortion, which reflects the effects of fertility reduction due to the practice of induced abortion. In China induced abortion is legal and can be performed both in hospitals and in family planning service stations. However, induced abortion is used as a back-up for contraceptive failure, rather than a means of family planning (Government of PR China 1994). Normally, an induced abortion always aborts less than one birth and the number of births averted per induced abortion is strongly influenced by the practice of contraception following the induced abortion. Other studies found that induced abortion in China played a less important role in fertility decline than delayed marriage and contraception (Chen 2003). As shown in Table 8.7, induced abortion contributed 27 percent and 23 percent to fertility reduction in 1990 and 2000, respectively. The 5.2 percent reduced contribution to fertility reduction from 1990 to 2000 is most likely to be the result of improvement in contraceptive effectiveness.

C_i is the index of postpartum infecundability, suggesting the reduction of fertility due to the effects of extended periods of postpartum amenorrhoea and abstinence on fertility. It is primarily determined by the duration of breastfeeding. Unfortunately, data about the duration of breastfeeding were unavailable in most surveys. Up to the present, the scarce but reliable data have come from the IDFS survey data in 1985-87. Gao and his colleagues (1989: 337) calculated that the average duration of lactation was 3.6 months in Shanghai and around six months in Hebei and Shannxi province from 1980 to 1985. It is expected that the rapid socio-economic development and large-scale rural-urban transformation could reduce the breastfeeding period for rural young women. It is suggested in the 2000 census that many young mothers left their babies at home while working in cities or elsewhere (see Chapter 4). In the absence of reliable data, this study assumes that the average duration of breastfeeding in the 1990s was six months. The estimated fertility-inhibiting effect of postpartum infecundability, around 18 percent from 1990 to 2000, is lower than the effects of the other three major proximate determinants.

As shown in Table 8.7, the total fertility declined by 26 percent from 1990 to 2000, of which 11.6 percent resulted from the postponement of marriage, and 20.5 percent came from the CPR increase and improvement of contraceptive effectiveness. Table 8.8 further exhibits the extent of the total fertility-inhibiting effects accounted for by each proximate determinant in 1990 and 2000. The extent of each proximate determinant is prorated by the proportion of the logarithm of each index to the sum of logarithm of all indices (Wang et al. 1987). The difference between the maximum potential fertility, taken as 17.01 in China, and the estimated total fertility is due to the combined effects of four proximate determinants. Among all births inhibited in 1990, 25.4 percent was due to delayed marriage and 50.6 percent was from contraception. In 2000, 27.3 percent births were inhibited by delayed marriage and 53.8 percent by contraception. While induced abortion contributed 14.5 percent to fertility reduction in 1990, it only contributed to 10.7 percent in 2000.

Table 8.8 Extent of the total fertility-inhibiting effect of each proximate fertility determinant in China, 1990 and 2000

Proximate determinants (indices)	Fertility-inhibiting effect			
	1990 TFR	2000 TFR	1990 (percent)	2000 (percent)
Marriage (C_m)	0.50	0.40	25.4	27.3
Contraception (C_c)	1.00	0.79	50.6	53.8
Postpartum infecundability (C_i)	0.19	0.12	9.4	8.3
Induced abortion (C_a)	0.29	0.16	14.5	10.7
Total: [17.01-TFR (estimated)]	1.97	1.46	100.0	100.0

Source: Own calculations based on the 2001 survey.

Note: The total fertility-inhibiting effect is prorated by the logarithm of each index, e.g. effect of marriage: [TF-TFR (estimated)]*log C_m/(log C_m +log C_c +log C_i +log C_a).

8.7 Conclusion

This chapter examines the levels, patterns and trends of female marriage and contraception, and their effects on actual fertility. It has already been demonstrated that the rise and fall of female marriage age played an important part in the dramatic fertility decline in the 1970s and fertility fluctuations in the 1980s. The 1990s saw another rise in female marriage age, increasing by one year from 1991 to 2000. It is estimated that births were reduced by about 7 percent, or 13.4 million by the postponement of female marriage in the 1990s. Since non-marital fertility is negligible in China, delayed marriage also changes the childbearing schedule, which generates ‘tempo’ effects resulting in distortion in the conventional total fertility rates. This was one reason for the very low values of fertility as observed in surveys and census, in addition to underreporting of births and actual decline of marital fertility in the 1990s.

The family planning program relies heavily on contraception and the program strengthening in the 1990s further increased the contraceptive prevalence rate to a very high level. In addition, the program reorientation since the mid-1990s also greatly improved contraceptive effectiveness. The application of the Bongaarts model demonstrates the extremely important contributions of marriage and contraception to the fertility decline in the 1990s. Among all births being inhibited in 1990 and 2000, more than 75 percent of fertility reduction was due to delayed marriage and increased contraceptive prevalence. Induced abortion played a less important role in fertility reduction as a back up for contraceptive failure. Of the 26 percent reduction of total fertility from 1990 to 2000, 11.6 percent was due to marriage postponement, and 20.5 percent resulted from the increase in contraceptive prevalence rate and improvement of contraceptive effectiveness.

Chapter 9 Concluding Remarks

Following dramatic decline in the 1970s and fluctuation above replacement level over the course of the 1980s, China's fertility declined again in the 1990s. Since the early 1990s, a number of surveys, and the more recent 2000 census, gathered by different government agencies at different points in time, consistently reported a sudden fertility drop between 1990 and 1991, and then a continued decline to a very low level by the end of the decade. However, how fast and how far fertility declined has long been the subject of considerable debate. While the controversy in the early 1990s focused on whether China had reached below-replacement fertility, by the late 1990s and early 2000s the debate had shifted to how far below-replacement the fertility level was.

Most researchers tended to interpret the reported very low fertility as an illusion arising from serious underreporting of births, more serious than the preceding decade, and attributed to the program strengthening since the early 1990s. They believed that births may have been underreported by an astonishing 20 to 30 percent, and fertility did decline but only moderately, probably around 1.8 births per woman since the early 1990s. Nonetheless, given the consistency of reported fertility both across data sources and over time, a small group of demographers challenged the overcautious interpretation and argued that surveys and census very likely reflected the reality of a faster decline of fertility, even allowing for some underreporting of births. Consequently, they suggested that fertility continued to decline substantially during the 1990s, and very likely in the range of 1.5-1.6 children per woman.

All demographers agree that surveys and censuses suffer from underreporting of births, but disagree over the exact extent. A review of the literature did not find convincing evidence to support the serious-underreporting argument. Moreover, it found that there was a lack of systematic examination of the data-specific problems and interrelationships between them, which resulted in misunderstanding of data problems and confusion in fertility correction. Further analysis suggested that previous studies put too much attention to data quality but greatly neglected the programmatic and societal changes that occurred in the 1990s. Consequently, this

study suggested that it was not only necessary to fully appreciate the data-gathering efforts and their specific problems, but also to completely understand the programmatic and societal changes and accordingly their effects on both fertility change and data collection.

This thesis asked the question whether the reported far below-replacement level fertility was a reality of substantial fertility decline, or just an illusion arising from underreporting of births. Because of the nature of the controversy over fertility levels, this study devoted most efforts in assessing data quality, especially in estimating the extent of underreporting, through: (1) identifying the problems in different data collection efforts, and estimating the respective extent of underreporting of births, (2) reconstructing the levels and trends of fertility in the 1990s, and (3) examining the corroborating evidence for fertility decline. Owing to data limitations, all analyses are carried out at the national level. On the basis of whole analysis, this study addressed the research objective through addressing the following major questions, and clearly made a conclusion about the levels of fertility in the 1990s.

9.1 Should the programmatic changes following the 1991 Decision only be blamed for serious data deterioration?

China's family planning program both affects fertility behaviour of individual couples and the data gathering efforts of government agencies. It has been a consensus among demographers that China's family planning program was a major determinant to the rapid decline of fertility. However, starting from the 1990s, the criticism on its negative effects on fertility data increasingly became significant. It was widely believed that the 1991 Decision and the following program strengthening should be responsible for serious data deterioration from the early 1990s. This study suggested that this argument was both mistaken in interpreting the programmatic changes and incomplete in estimating their effects on fertility reduction.

The 1991 Decision set the tone for the family planning policy and program efforts during the 1990s, which pushed governments at all levels to greatly increase

administrative and economic input to improve the program implementation. As well documented by Greenhalgh and Winckler (Greenhalgh and Winckler 2001; Winckler 1999; 2002), the program efforts were greatly strengthened in every aspect, from political commitment, funding and personnel to technical service. However, it is important to note that this 'strengthening' was mainly meaningful in contrast to the 'weakening' of policy implementation in the 1980s. Despite the strict requirement in the policy, and harsh words in local official language, the family planning work was difficult to implement, 'the most difficult one under the heaven' (*tianxia diyi nan*), because of the weakened state control over peasants resulting from the rural reform in the early 1980s. The sudden policy relaxation in the mid-1980s reduced the support from local program workers. In addition, the lack of enough funding, necessary personnel and low quality of contraceptives further aggravated the problems in implementation (see Greenhalgh 1993; Wang and Hull 1991; White 1991). Consequently, the weakened program performance on the one hand, and higher fertility demands among peasants on the other hand, contributed to a higher than expected fertility in rural areas, resulting in stalling of fertility decline over the decade. This situation was only completely reversed after the 1991 Decision, of which the most important contribution was to ensure the real implementation of family planning policy.

This study has shown that the 1991 Decision did not alter the policy restrictions regarding the number and spacing of children that a couple was allowed to bear, nor did it tighten up the national population control target. On the contrary, the family planning policy in rural areas had been remained stable after the 1984 relaxation under the program slogan of 'stabilising the current policy', which permitted a little more than half the peasants to have a second child. Moreover, the program target was further relaxed to limit population by the year 2000 to 1.3 billion rather than the 1.25 billion proposed in the mid-1980s. To this end, the family planning program only needed to reduce fertility slightly from 2.3 in 1990 to 2.1 in 1995, and further to 2.0 in 2000 (Gu 1992; 1994). Furthermore, during the policy implementation, the SFPC highlighted that the program should be implemented strictly, but more frequently emphasised that it should be performed well (Peng 1991a). From the mid-1990s, the SFPC further initiated a client-centred reorientation of the program and increasingly expanded to most areas.

The program strengthening would be conducive to fertility reduction primarily in two aspects. First, it would ensure most couples to have births in a 'planned' way expected by the program. Previous studies have shown that rural couples in the 1980s tended to marry earlier, have children earlier, and have more than the permitted number of children if possible (Feeney et al. 1989; Gu and Yang 1991). In addition to stalling decline of marital fertility, the decreasing age at marriage and childbearing, and the reducing birth interval further inflated the observed period fertility. As a matter of fact, if most couples had births as the policy required both in parity and in timing, the fertility at the national level would have been around 1.5 as shown by a group of demographers recently (Guo et al. 2003). Moreover, the increasing age at marriage and childbearing and increased birth interval in the 1990s would in turn deflate the observed fertility even lower. Second, it would improve the overall program performance at the national level and reduce regional difference at the provincial level. It was argued that the program strengthening increased pressure on local program workers, who would collude with couples to manipulate statistical figures to 'meet' the pre-set targets (Zeng 1996). This was the case in areas where the fertility control was still difficult, including both 'backward' provinces and 'backward' areas within a province. However, the 1980s had seen the reduced provincial differences in fertility level (Gu 1994; Tu 2000). Along with the improvement of program efforts in the 1990s, it can be expected that both the numbers and the range of 'backward' areas would be greatly reduced. Consequently, there was no strong reason to suspect that underreporting of births became increasing worse if the program performance in most areas improved.

Last but no least, almost all serious-underreporting arguments about fertility data can be traced back to one study by Prof. Zeng Yi, which was carried out in 1994, first published in Chinese in 1995 and then in English in 1996 (see Greenahlgh et al. 1994, Zeng 1995, 1996). However, when Zeng made his conclusion that data deteriorated seriously due to the program tightening, he only referred to the situation in the early 1990s. Even his finding was 100 percent right, it could not catch up the rapidly changing reality in the late 1990s and early 2000s. Moreover, this study had shown that his estimation most likely over-estimated the extent of underreporting in the 1992 survey. Unfortunately, in the following years, few researchers recognised

these limitations when frequently citing this conclusion and hence mistakenly interpreted reality.

9.2 Did all fertility data deteriorate more in the 1990s than in the 1980s?

It appeared that many demographers were frustrated by the continually observed very low fertility in surveys and census. Consequently, they tended to conclude that fertility data deteriorated more seriously in the 1990s than in the preceding decade. However, this study argued that this was not necessarily the case, because the observed very low fertility may have resulted from serious underreporting, but it was at least equally likely to reflect a reality of substantial fertility decline.

Detailed examination in this thesis on the major fertility data in population statistics did not find convincing evidence to support the serious-underreporting argument, except for the 2000 census. Moreover, this study found that this argument resulted from misunderstanding of different data sources. For example, although not being employed by demographers in fertility analysis, however, the *hukou* statistics have exerted important influences on the general understanding of data quality, because of their close relationship with all other data sources. The quality of the *hukou* statistics deteriorated during the last two decades, along with the diminished importance of the *hukou* system in the wake of rapid socio-economic development, as well as the introduction of the one-child policy. As a foundation for all other data collection operations, their weakened reliability undoubtedly contributed to some extent incompleteness to other statistics. Bear this in mind one would not immediately attribute the shortage of births in other statistics to outright underreporting of out-of-plan births alone.

The common misunderstanding of the family planning statistics was another example. The quality of the program statistics was notorious even in the 1980s, and they still suffered from serious underreporting in the 1990s. But, as shown in this study, the available evidence failed to demonstrate that they became worse in the 1990s than in the 1980s. The detected extent of underreporting in local program

statistics from the SFPC village surveys, up to 35 percent in rural villages of some provinces, was the most important and most frequently cited evidence for the serious-underreporting argument. However, this study found that this interpretation was wrong both in understanding the relationship between the program statistics and other data sources, and interpreting the survey findings. As an internal data source compiled from registrations at the basic level, the double roles of local program workers, being as data collectors at the same time, made the family planning statistics suffered serious distortion. The SFPC village surveys were successful in revealing this problem, but their findings were only meaningful to local statistics in surveyed areas. The arbitrary application of the detected extent of underreporting from local program statistics in other areas or in other data sources undoubtedly resulted in the over-estimation of problems. More importantly, it neglected the far-reaching implications of the village surveys: they demonstrated that the data manipulation and falsification primarily came from local program workers, and the direct contacts between the interviewers and respondents were greatly helpful in obtaining truth once avoiding intermediate interferences.

As most demographers used annual surveys in fertility analysis in the 1990s, they did not suspect that these surveys became worse than the 1980s. However, although the quality of annual surveys in the 1980s was highly suspect, this study suggested that the simple comparison of estimated number of births with other source and ignorance of the baseline errors in annual surveys led to overstate their underreporting problems. More importantly, this misinterpretation resulted in over concerns of data quality in the 1990s. As a matter of fact, many measures taken by the SSB starting from 1989 to improve the quality of annual surveys were helpful, including changing the reference period, revolving samples each year, and counting people with more *de facto* factors. In the 1990s, annual surveys included more out-of-plan births due to their being misreported as first-order births. In addition, the practice of conducting post-enumeration surveys was useful in quantifying the extent of births missed.

The 1982 one-per-thousand survey and the 1988 two-per-thousand survey brought good reputation to the SFPC series of retrospective surveys, but the 1992 survey resulted in the decade-long controversy over data quality and fertility levels. There is no dispute that the problematic 1992 survey seriously underreported births in years

close to the survey, but newly available evidence suggested the extent of underreporting may not be so serious as generally believed. Moreover, this study suggested it would be more helpful in understanding the survey-specific causes for the underreporting problem. Because the SFPC gained lessons from the 1992 survey and intentionally avoided those mistakes when organising the later 1997 and 2001 surveys, they probably had better quality, as illustrated by both the internal consistencies and the post-enumeration survey (Wang 2000b).

Many studies have shown that the 1982 and 1990 censuses have good quality with slight undercounts and overcounts. However, the 2000 census encounter more problems in census completeness, primarily owing to the combination of hugely increasing population mobility and new census procedures as argued in this thesis. The effect of large-scale population migration on fertility estimation is direct and obvious. This has been illustrated by the fact that while about 2.6 million women of reproductive age were over-counted, up to 11.6 percent births were enumerated in the census but not being reported by their birth mothers due to temporary migration in 2000. Comparison of fertility estimated by the application of own-children method (Retherford et al. 2004), avoiding the effects of 'partial' underreporting due to migration, with those estimated from surveys still suggested a close agreement between them. It is important to note that along with the rapid socio-economic development and profound societal changes in China, the problems in census became similar to those in other countries (Chan 2003). Some authors attributed the census undercounts to the program tightening after 1991 (Goodkind 2004). However, as suggested by others, even in the absence of family planning program, China's 2000 census probably would have still suffered from undercount and over-count problems (Anderson 2004).

Many researchers highlighted the negative effects from the family planning program on the quality of fertility data, but greatly neglected the huge differences between data sources and their underlying causes. As suggested in this thesis, these negative effects on reporting of births are sufficient but not necessary. Whether individual couples underreported out-of-plan births has largely been dependent on the family planning requirement and the strength of policy enforcement in different areas and at different points in time. More importantly, the completeness of each data source has

been greatly associated with the different data collection efforts, in particular who collect the data or how data are collected, etc.

9.3 Did surveys and census suffer substantial underreporting of births in the 1990s?

The five population statistics can be classified into two categories: (1) the registration-based administrative statistics, including the *hukou* statistics and the family planning statistics, or the program statistics; and (2) the interviewed-based statistics, containing surveys and censuses. Previous studies have confirmed that surveys and censuses have a far more complete reporting of births than the registrations (Banister 1994; Coale 1984), although this did not attract attention from those demographers who maintained serious-underreporting argument. This thesis reveals that this difference results from the fact that surveys and censuses obtain information directly from respondents, largely avoiding intermediate interference. In addition, the thesis further reveals that the completeness of surveys and censuses also differ considerably because of their differences in coverage and the scale in recruitment and mobilisation of enumerators.

In their analysis of the 1992 survey, Feeney and Yuan (1994: 392) persuasively argued that the chance of substantial underreporting of births in surveys and censuses was very low. The detailed examination of each data source in this thesis came to the same conclusion. While many out-of-plan births were unreported in each statistical investigation, some were actually included in the data through being misreported in other ways. In addition, many ‘newfound’ children who had been ‘missing’ births in previous investigations appeared in the data of later ones. If later surveys or censuses continually failed to discover the suspected previous ‘missing’ births in a large scale over a decade, it is more likely that most of these suspected births never occurred.

After 1993, although a more intensive post-enumeration survey after the completion of annual survey each year has been carried out, which detected 6-7 percent underreporting in 1993-94 respectively, the SSB made higher upward adjustments, on average 12 percent in the 1990s. The comparison between the SSB official

estimates and other sources suggests that the SSB highly likely overstated the underreporting problems. Consequently, all the estimates of fertility based on the SSB official estimates are very likely to over-estimate fertility levels in the 1990s. This research did not find strong evidence to challenge the detected underreporting extent from the post-enumeration survey.

The comparison between annual surveys and 2001 survey revealed that they have systematically different patterns in reporting of births: the annual survey captured more births because of higher-order births being misreported as first-order births, evidenced by the contradiction between reported rise in the mean age at first marriage and at first order births, but the retrospective survey suffered from underreporting of higher-order births, supported by its highly skewed sex ratio at second-order births and above. Since there was only one correct figure of sex ratio at birth in the population, it supported that annual surveys included more births than the 2001 survey. The practice of misreporting of higher-order births as first-order births evidently occurred in annual surveys from 1996 to 1999, compared to annual surveys in 1993-94, they may have included 1-2 percent, on average 1.5 percent more second or higher-order out-of-plan births. Given the intensity of the SSB post-enumeration surveys, and the implications suggested by the SFPC village surveys, there is no strong reason to suspect the reliability of the 6-7 percent of births underreported in annual surveys in 1993-94. Comparison with independent sources also suggested that the extent of underreporting did not exceed 10 percent in annual surveys.

This thesis identified two primary patterns of underreporting of newborns and young children in censuses, as well as in surveys. The first is the pattern of ‘complete’ underreporting of births and children, which refers to births who were missed in previous censuses but revealed in the following ones. The analysis suggested that about 4 percent in 1982, 8 percent in 1990, and probably around 9-10 percent in 2000 of births and younger children were underreported. Nonetheless, caution is required because the estimation of the 1990 and 2000 censuses employed the questionable 2000 census and educational statistics, which may be a little too high. The second pattern is that of ‘partial’ underreporting of newborns, which mainly exists in census and sample census and refers to births, which were enumerated in the same census but not being reported by their birth mothers, primarily due to migration. It was

found that the extent of this underreporting pattern was 6.27 percent in 1995 sample census and 11.6 percent in the 2000 census long form, primarily due to increasing population mobility.

In general, this study suggested that annual surveys most likely underreported no more than 10 percent of births, and probably a little higher in the 2000 census. No convincing evidence was found that there was substantial underreporting of births in surveys and census by an astonishing 20-30 percent in the 1990s. Nonetheless, the 5-10 percent underreporting each year still constitutes a big data problem for demographic analysis and more importantly for the policy-making purpose. It is necessary for the government agencies to put more effort in improving data quality.

9.4 Was the reported far-below-replacement level fertility a reality or just an illusion?

Based on detailed examination of problems in each data source and assessment of their roles in fertility analysis, this study employed the unadjusted data of annual surveys in 1991-94 and 1996-99, the 1995 one percent sample census and the 2000 census 10 percent long form to re-estimate levels of fertility in the 1990s. Due to uncertainties in determining exact extent of underreporting in each year, it assumed two scenarios with slightly different extent of underreporting of births. This study first re-estimated age-specific fertility rates and total fertility rates in the survey samples and then estimated annual numbers of births using the adjusted female age distribution. Comparison with all other available sources suggests that both series estimated more births than those recorded in registrations and estimated from the 2000 census. But the estimated birth series with higher-underreporting extent exceed the official estimates in 1991-92 and are quite close to them in most other years. Because this study had already shown the over-estimation in official estimates, the analysis rejected the series with higher-underreporting estimation. Nevertheless, both series agree that the fertility declined from around 2.0 to 1.7 in the first half of the 1990s, and reached a lower level around 1.5-1.6 by the end of last century, but the series with lower-underreporting estimate suggest a slightly faster decline of fertility, about one-third reduction from 2.30 in 1990 to 1.55 in 2000.

As discussed earlier, had there been no underreporting of births in statistical investigations, and had there been no controversy over how to estimated the extent of underreporting, one could conclude with great confidence that China had already joined the group of countries of very-low fertility as early as the mid-1990s. However, the detailed and painstaking analysis in this study showed that even allowing some underreporting of births, no more than 10 percent, surveys and census still reported a continued decline of fertility over the decade to a very low level. Thus, this thesis concluded that the reported very low fertility primarily reflected the reality that fertility continued to decline substantially over the course of the 1990s. The true fertility level was not so low as 1.22 in 2000 as reported in the census, but most likely in the range between 1.5 and 1.6. This is the same conclusion as that of a group of demographers in the East-West Population Institute based on thorough analysis of census data of 1990 and 2000 censuses (Retherford et al. 2004).

Previous studies have shown that both the family planning program and socio-economic development are the two major determinants of fertility decline. Evidently, the sudden fertility drop between 1990 and 1991 was accompanied by a large increase in the numbers of family planning operations, such as sterilisations, IUD insertions and induced abortion. Meanwhile, the rapid socio-economic development that occurred in the 1990s began to play a more important role. It not only was greatly beneficial to increase investment in the family planning program at the macro level, but also brought about increasing expectations and aspirations of urbanites and rural migrants, which in turn affected their fertility preferences and behaviour at the individual level. Many authors highlighted the low developmental level in China, but in a rapidly changing society with fast developmental pace, rising expectations and aspirations were probably more important in affecting childbearing behaviour. It is most likely that the combination of a strong family planning program and rapid socio-economic development contributed to the remarkable decline of fertility.

It was once widely believed that in a large developing country like China any further decline of fertility below-replacement level would be difficult. Despite being persuasive in the early 1990s, the experiences of demographic change in both developed and developing countries demonstrated its being outdated (United Nations

2003). Comparison with experiences in the Republic of Korea and Thailand suggested that there was no strong reason to suspect the rapidity of fertility decline below-replacement level in China, given the rapid socio-economic development and the strength of family planning program. Nonetheless, when using the observed low fertility to estimate complete fertility of women for policy-making purpose, caution is needed to note the "tempo" effects due to changing fertility behaviour as in many post-transition countries (Bulatao and Casterline 2001, United Nations 2002).

This study examined the changes in fertility preferences during the past three decades. A review of literature reported a clear trend of decline in ideal family size, from about three children in the 1970s to on average below two until the mid-1990s. The more recent 1997 and 2001 surveys suggest a further slight decline in the late 1990s and early 2000s. Although more than half married women still preferred two children in 2001, most wanting one child of each sex, there were increasingly more married women preferred one child, even in rural areas. Undoubtedly, there was a growingly narrow gap between the family planning program and the popular family size preference, which offered a solid foundation for the continued and substantial decline of fertility during the 1990s.

This study also examined the relative importance of two proximate determinants of marriage and contraception in fertility reduction. A number of surveys and census reported an increase in the female marriage age in the 1990s. Using the approach of Coale and his colleagues (1991: 391), this study suggested that about 13.4 million, or 7 percent of births, were reduced due to the marriage postponement in the 1990s. The family planning program put the promotion of contraception as the program priority. During the 1990s, the CPR increased to a very high level, nearly universal contraception among fecund married women. The application of Bonggarts model shows the extremely important contributions from delayed marriage and contraception from 1990 to 2000. Using a decomposition approach, it found that during the 26 percent fertility reduction from 1990 to 2000, the delayed marriage and widespread contraception accounted for 11 percent and 25 percent, respectively. All these findings further corroborated the assertion that a continued decline of fertility to a very low level is real.

9.5 Limitations of this thesis and future research

This thesis re-estimated levels and trends of fertility for the 1990s, in the process addressing the question of whether the far below-replacement level fertility reported in surveys and census was genuine. As frequently highlighted in this thesis, it would have been a quite simple exercise of numbers, had there been no systematic underreporting of births in surveys and censuses. However, it was the different conflicts of interpretation of fertility data, particularly the different estimations of the extent of underreporting in surveys and censuses that produced controversy over fertility. Consequently, this thesis devoted most effort to identifying problems in different data sources and estimating the extent of underreporting. China has huge population and its rapid socio-economic development has been remarkable. In this context, China's fertility declined to far below replacement level is important, but equally the causes and the implications of such a remarkable decline are very important both in theory and in practice. However, with the framework of the current thesis, it is not possible to do more for these aspects than touch on them briefly and suggestively.

Even for research of data quality, this thesis still faces limitations regarding data availability. As mentioned in Chapter 1, the analyses in this thesis were carried out at the national level without attention to rural-urban differences and regional variations. Even for the national level analysis, the research is still restricted in the absence of necessary data. Some data problems may result from the non-release of data by the government agencies concerned, but more may be due to the failure to collect key variables. It has been suggested by some demographers that the relevant government agencies should co-ordinate data collections to reduce the repetition of efforts and the expansion of data variety (Qiao 1995). This study strongly supports such request.

There is a significant difference between the official estimates of total fertility around 1.8 and that between 1.5 and 1.6 as suggested by this research and the like. Whether China's fertility reached levels far below-replacement has far-reaching policy implications. The family planning program has been implemented for more than three decades, and the one-child policy has also been in place for more than two

decades. When the strict family planning program was introduced in the late 1970s, the level of socio-economic development was very low and popular fertility preferences were high in both urban and rural areas. As admitted even by the program leaders, the program success in achieving low fertility has been achieved with huge administrative inputs and at the expense of individual reproductive choice. Certainly, the program has already recognised this, and started a reorientation with a client-oriented approach in the mid-1990s. However, given that most estimates of fertility levels suggested a moderately low fertility, the Chinese government has always been cautious about the possibility of relaxing the strict one-child family planning policy implemented since the mid-1980s. Also, there has been a lack of in-depth research about the underlying causes for very low fertility and changes in reproductive preferences and behaviour.

During the past three decades, China has experienced economic take-off accompanied with remarkable societal changes, and accordingly changes in the values, aspirations and interests of individuals. Moreover, the generation born after the introduction of the one-child policy has already entered marriageable age. Numerous studies have pointed out the unintended consequences of the one-child program, such as abnormal sex ratio at births, rapid population ageing, and the shortage of labour force, etc. There have been a variety of population projections of the future population size to the middle of this century. However, none of them assumed that fertility would decline so fast or so far as revealed in this thesis. The implication of this research is that if fertility did decline that fast and that far, probably it is now time to consider an alternative for the one-child family planning policy. However, any policy change touches the lives of hundreds of millions of people, and there should be caution on the basis of more complete and more thorough analysis. In this sense, this research forms a starting point for a newly invigorated set of population research questions in China.

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Appendix: Table A1 Reconstructed age structure of women of reproductive age in China, 1990-2000

q(x) in 1990	Age 90	Total	Age 91	Total	Age 92	Total	Age 93	Total	Age 94	Total	Age 95	Total	Age 96	Total	Age 97	Total	Age 98	Total	Age 99	Total	Age 00	Total
0.0009	5	9,734																			15	9,680
0.0007	6	9,507																	15	9,462	16	9,456
0.0006	7	10,017															15	9,976	16	9,970	17	9,963
0.0005	8	10,596													15	10,560	16	10,553	17	10,545	18	10,536
0.0005	9	8,722											15	8,696	16	8,690	17	8,684	18	8,676	19	8,667
0.0005	10	9,268									15	9,245	16	9,239	17	9,233	18	9,224	19	9,215	20	9,205
0.0005	11	9,336							15	9,317	16	9,311	17	9,304	18	9,296	19	9,286	20	9,276	21	9,266
0.0005	12	9,137					15	9,123	16	9,117	17	9,111	18	9,102	19	9,093	20	9,083	21	9,073	22	9,062
0.0005	13	9,379			15	9,370	16	9,364	17	9,357	18	9,349	19	9,339	20	9,329	21	9,318	22	9,307	23	9,223
0.0005	14	9,923	15	9,917	16	9,911	17	9,904	18	9,895	19	9,885	20	9,874	21	9,862	22	9,850	23	9,761	24	9,826
0.0007	15	10,520	16	10,513	17	10,506	18	10,496	19	10,486	20	10,474	21	10,462	22	10,449	23	10,355	24	10,424	25	10,410
0.0009	16	11,612	17	11,604	18	11,594	19	11,582	20	11,569	21	11,556	22	11,542	23	11,437	24	11,513	25	11,498	26	11,484
0.0010	17	12,114	18	12,103	19	12,091	20	12,078	21	12,064	22	12,049	23	11,940	24	12,019	25	12,004	26	11,989	27	11,976
0.0011	18	12,175	19	12,162	20	12,149	21	12,135	22	12,120	23	12,011	24	12,090	25	12,074	26	12,060	27	12,046	28	11,921
0.0012	19	13,182	20	13,167	21	13,152	22	13,136	23	13,017	24	13,103	25	13,086	26	13,071	27	13,056	28	12,920	29	13,027
0.0012	20	12,796	21	12,782	22	12,766	23	12,650	24	12,734	25	12,718	26	12,702	27	12,688	28	12,556	29	12,660	30	12,644
0.0012	21	13,628	22	13,611	23	13,488	24	13,577	25	13,560	26	13,544	27	13,528	28	13,387	29	13,498	30	13,481	31	13,465
0.0013	22	11,812	23	11,706	24	11,783	25	11,768	26	11,754	27	11,740	28	11,618	29	11,714	30	11,700	31	11,685	32	11,670
0.0013	23	10,867	24	10,939	25	10,925	26	10,911	27	10,899	28	10,785	29	10,875	30	10,861	31	10,848	32	10,834	33	10,820
0.0012	24	12,390	25	12,374	26	12,359	27	12,345	28	12,216	29	12,317	30	12,302	31	12,287	32	12,271	33	12,255	34	12,153
0.0012	25	11,801	26	11,787	27	11,774	28	11,651	29	11,748	30	11,733	31	11,719	32	11,704	33	11,688	34	11,591	35	11,656
0.0012	26	12,333	27	12,319	28	12,191	29	12,292	30	12,276	31	12,261	32	12,245	33	12,230	34	12,127	35	12,196	36	12,177
0.0012	27	13,065	28	12,929	29	13,036	30	13,019	31	13,003	32	12,987	33	12,970	34	12,861	35	12,934	36	12,914	37	12,895
0.0011	28	7,787	29	7,852	30	7,842	31	7,833	32	7,822	33	7,812	34	7,747	35	7,791	36	7,779	37	7,767	38	7,754

0.0013	29	5,660	30	5,653	31	5,646	32	5,639	33	5,632	34	5,584	35	5,616	36	5,607	37	5,599	38	5,590	39	5,580
0.0012	30	6,863	31	6,854	32	6,845	33	6,901	34	6,779	35	6,818	36	6,807	37	6,797	38	6,786	39	6,775	40	6,762
0.0013	31	6,847	32	6,838	33	6,829	34	6,772	35	6,810	36	6,800	37	6,790	38	6,778	39	6,767	40	6,755	41	6,741
0.0013	32	9,238	33	9,226	34	9,149	35	9,200	36	9,186	37	9,172	38	9,157	39	9,142	40	9,125	41	9,106	42	9,087
0.0013	33	8,950	34	8,875	35	8,925	36	8,977	37	8,898	38	8,883	39	8,868	40	8,852	41	8,834	42	8,816	43	8,759
0.0014	34	8,540	35	8,588	36	8,575	37	8,562	38	8,548	39	8,534	40	8,518	41	8,501	42	8,483	43	8,429	44	8,413
0.0015	35	9,398	36	9,384	37	9,370	38	9,354	39	9,339	40	9,322	41	9,303	42	9,283	43	9,224	44	9,206	45	9,214
0.0015	36	9,022	37	9,008	38	8,993	39	8,978	40	8,962	41	8,943	42	8,925	43	8,867	44	8,851	45	8,858	46	8,832
0.0017	37	8,413	38	8,399	39	8,386	40	8,370	41	8,353	42	8,336	43	8,282	44	8,267	45	8,273	46	8,249	47	8,223
0.0017	38	8,197	39	8,184	40	8,169	41	8,300	42	8,135	43	8,083	44	8,067	45	8,074	46	8,050	47	8,025	48	7,997
0.0018	39	7,001	40	6,988	41	6,973	42	6,959	43	6,914	44	6,901	45	6,907	46	6,886	47	6,865	48	6,841	49	6,799
0.0021	40	7,174	41	7,160	42	7,145	43	7,099	44	7,085	45	7,091	46	7,070	47	7,048	48	7,023	49	6,980		
0.0021	41	6,187	42	6,174	43	6,134	44	6,123	45	6,128	46	6,110	47	6,090	48	6,069	49	6,032				
0.0023	42	5,934	43	5,895	44	5,884	45	5,889	46	5,872	47	5,853	48	5,833	49	5,797						
0.0024	43	5,682	44	5,671	45	5,676	46	5,759	47	5,641	48	5,622	49	5,587								
0.0028	44	5,287	45	5,291	46	5,275	47	5,259	48	5,240	49	5,208										
0.0029	45	4,931	46	4,916	47	4,901	48	4,884	49	4,854												
0.0032	46	4,732	47	4,717	48	4,701	49	4,672														
0.0035	47	4,454	48	4,438	49	4,411																
0.0039	48	4,580	49	4,552																		
Total females aged 15-49				312,576		316,922		321,562		325,331		329,251		332,202		336,606		340,276		343,174		345,341

Sources: Own calculations based on the 1982, 1990 and 2000 censuses (see text in Chapter 6); the value of q(x) is from the 1989-90 female life table.