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Chinese Fertility Trends 1979-2000: A Comparative Analysis of Birth Numbers and School Data

Zusammenfassung: Dieses Paper ist die englische Version eines gleichzeitig publizierten Artikels in chinesischer Sprache. Es untersucht chinesische Fruchtbarkeitstrends vom Beginn der Ein-Kind-Politik 1979 bis zum letzten Zensus 2000. Zu diesem Zweck unternimmt es eine vergleichende Analyse von retrospektiven Daten aus den chinesischen Fruchtbarkeitserhebungen und den jährlichen Erhebungen des chinesischen Nationalen Statistischen Amtes. Auch Retro-Berechnungen aus den vierten und fünften Volkszählungen, Geburtenzahlen aus den Jahresberichten der Geburtenplanungskommission und Geburteneinträge aus dem Meldewesen des Ministeriums für Öffentliche Sicherheit werden miteinander verglichen. Angesichts der großen Datendiskrepanzen analysiert die Studie sodann chinesische Grundschülerzahlen mit ihren definitorischen und prozeduralen Problemen, um das chinesische Fruchtbarkeitsniveau im Zeitraum 1990-1997 zu schätzen. Da die anhand von Schülerzahlen berechneten Fruchtbarkeitstrends die meisten Daten aus anderen Quellen übertreffen, deuten sie auf eine verbreitete Unterzählung von Geburten hin. Dennoch liegen die berechneten Geburtenzahlen für 1996 und 1997 niedriger als revidierte Zahlen des Nationalen Statistischen Amtes. Trotz den ernsten Unterzählungsproblemen bestätigt die Analyse, dass sich die chinesische Fruchtbarkeit seit 1992 unter dem Ersatzniveau bewegt. Die anhand von Schülerzahlen berechnete zusammengefasste Geburtenziffer Chinas ist auf circa 1,6 Kinder pro Frau im Jahre 1997 zurückgegangen.

Schlagworte: Fruchtbarkeitsniveau; Unterzählung der Geburten; Schülerzahlen; vergleichende Analyse von Geburtenzahlen

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Abstract: This paper is the English version of a simultaneously published article in Chinese language. It studies Chinese fertility trends from the beginning of the one-child policy in 1979 to the last census in 2000. For this purpose, it undertakes a comparative analysis of both retrospective data from the Chinese fertility surveys and the annual surveys of China's National Bureau of Statistics. Reverse calculations from the fourth and fifth population censuses, birth data from the annual reports of the Birth-Planning Commission and birth records from the Ministry of Public Security's household registration are also compared. In view of the large data discrepancies, the paper then analyzes Chinese primary school data with their definitional and procedural problems in order to assess China's fertility level during 1990-1997. As the fertility trends calculated from school data surpass most figures from other sources, they hint at wide-spread underreporting of births. Nevertheless, the birth number calculations for 1996 and 1997 are lower than revised figures from the National Bureau of Statistics. Despite the serious problems of underreporting the analysis confirms that ever since 1992 Chinese fertility has been below replacement level. China's total fertility rate as calculated from school data has declined to circa 1.6 children per woman in 1997.

Key words: fertility level; underreporting of births; school data; comparative analysis of birth numbers

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Thomas Scharping

Chinese Fertility Trends 1979-2000:
A Comparative Analysis of Birth Numbers and School Data

Contents

1 An Enigma

An enigma characterizes Chinese fertility developments since the 1990s: Whereas the age structure of the population drove up the number of women in the high-fertility age groups and thus led all experts to expect another wave of births until 1996, the statistics show these in continuous decline since 1990. If fertility rates instead of absolute numbers are scrutinized, the gap between expected developments and eventual outcomes is even more dramatic. All populations surveys of the 1990s have the total fertility rate (TFR) plummet steeply in 1991 and continue to fall afterwards. The most spectacular drop is recorded in the final results of the 2000 census After the twists and turns of the 1980s, when it proved impossible to force the TFR down below 2.2 children per woman, both the scope and the speed of this sudden plunge come as a most astonishing surprise. Is there a genuine fertility decline, or are the numbers wrong? Do we witness a final success of the birth-planning program furthered by spontaneous socio-economic developments, or do we face statistical artifacts produced in reaction to tightened policies? Or are both fertility decline and high under-registration involved? And what would be their balance?

Demographers are bewildered, and expert opinion is divided. During the last decade, statements on the present level of Chinese fertility have ranged between a low of 1.4 children per woman and a high of 2.3. Most widely quoted has been the official assertion that the TFR has reached 1.8 to 1.9. But although it has been frequently repeated, the fact remains that the figure is anything but firm. In contrast to the 1980s, when population counts and surveys were acclaimed for their good fit and high degree of reliability, concerns with the quality of surveys from the 1990s abound, and estimates have largely replaced clear-cut enumeration results. Instead of improving the situation, the 2000 census with its spectacularly low figures for births and children has only added to the confusion. The most widely discussed reasons for this state of affairs can be bracketed under the rubrics: growing error margins of sample surveys due to shrinking sample sizes, specific problems of migrant registration, technical and financial implementation problems in population counting and survey work, popular evasion of birth-planning targets and fines, bureaucratic self-defense against the threats spelled out by the cadre evaluation systems.[1]

[1] For an attempt to discuss the overall background see: Scharping, Thomas, Birth Control in China 1949-2000, Population Policy and Demographic Development, London/New York 2003.

In view of these difficulties, this paper offers first a condensed review of the demographic evidence for past and present fertility levels as far as they can be reconstructed from the various censuses, micro-censuses and national fertility surveys, plus regular annual registration and survey schemes since 1982. Altogether, the data base adds up to 12 sets of figures on the national level, These can be compared with each other, checked for internal consistency and analyzed in regard to the sources of error. In the interest of space limitation and better visual conceptualization, the evidence is presented in abbreviated form as charts. The paper then proceeds to a discussion of school figures and their use for ascertaining fertility levels in earlier years. All school data under discussion will refer to primary schools, even if this is not spelled out in every case. Because school data have been used only sparingly in the existing literature, the paper will also provide tables of the relevant original figures used for further calculations. It then discusses problems of sources, indicators and definitions, as well as the policy and procedural background on which the data have to be interpreted. In its final section, the paper will offer some conclusions on usable and non-usable school data and a derived time series of births in the period 1979-93.

2. Conflicting Evidence from the Fertility Records

Five national fertility surveys have been undertaken ever since China revived professional demographic statistics at the end of the 1970s. Staged in 1982, 1988, 1992, 1997 and 2001, they have collected birth histories and the most detailed fertility data available on the national level. Although the size of their samples has shrunk tremendously in the 1990s, and the last two surveys do not allow any more a meaningful discussion of fertility trends among women aged 15-19 or 35-49, the data remain good enough to derive fertility rates for age groups 20-24, 25-29, and 30-34 within confidence intervals of +/- 6%, +/-7% and +/-14% respectively in 1997. The margins would be smaller by approximately one third in the 2001 survey. But still this would be much bigger than margins of +/- 1-3% during the 1980s.[2]

Charts 1a-c show age-specific fertility rates (ASFR) from the six national fertility surveys and contrasts them with the results of the 2000 census, plus a series derived from the

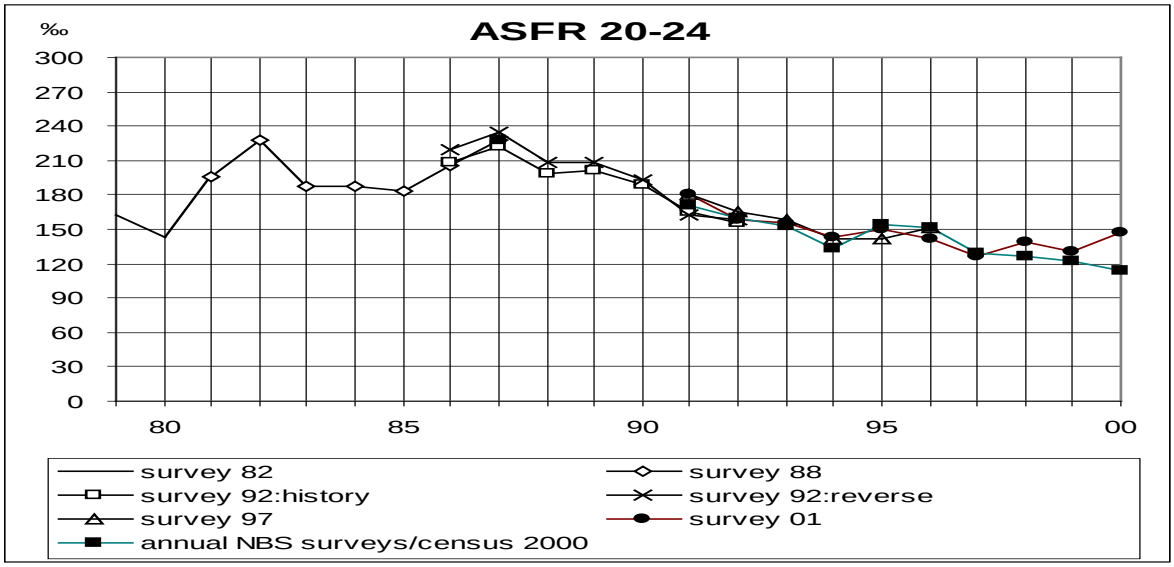
[2] Own estimates from past national fertility survey figures as presented in ZJSN 1986, Chen Shengli 1991, Liang Jimin and Chengli 1993, Jiang Zhenghua 1995, Jiang Zhenghua 2000, and data on design effects as given in Hao Hongsheng and Gao Ling 1997. The figures given here are approximations that are only based on case numbers. Changing survey designs could not be taken into account.

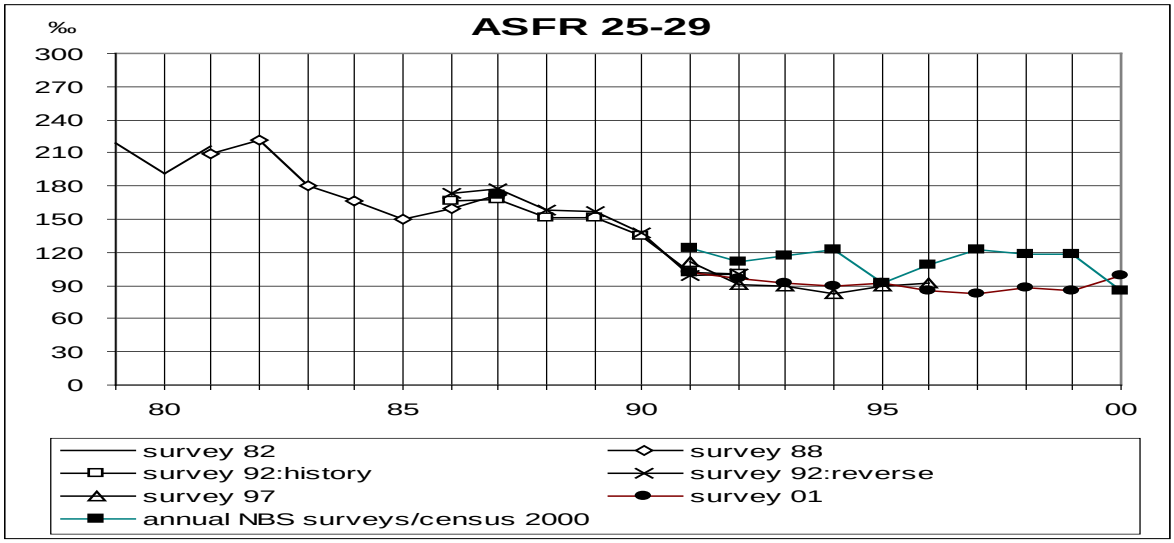
National Bureau of Statistics' (NBS) annual sample survey on population dynamics (including the 1995 micro-census). The latter series is hailing from unadjusted figures in the regularly published *Yearbook of Chinese Population Statistics*. The charts concentrate on women aged 20-34 for whom meaningful data are available. They do not include figures for age groups 15-19 and 35-49. In 1980 these age groups contributed only 12 % of total fertility. Ever since their contribution has fallen to roughly 5 %. Even though comparisons of different survey data for these age groups regularly show large error margins outside the overlap of confidence intervals, their impact on overall fertility thus remains limited.

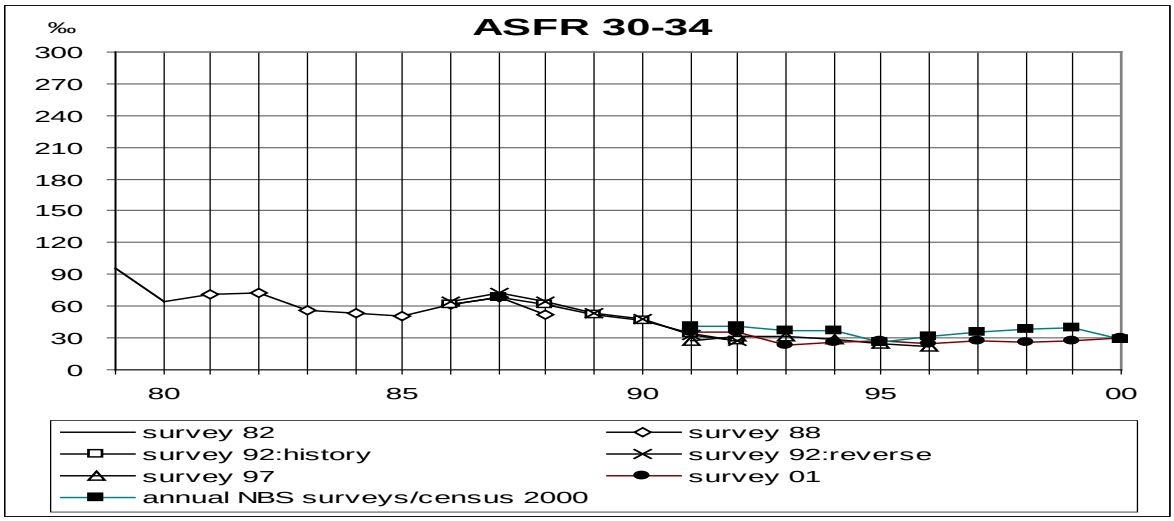
As far as the high-fertility age groups 20-34 are concerned, the retrospective results from the various fertility surveys display an almost perfect fit for the 1980s. The closeness of the figures for the following decade is impressive, too. No matter whether the 1997 fertility survey is compared to the earlier one from 1992 or whether the 2001 survey is matched with the one from 1997 – the results always stay within the overlap of confidence intervals and thus seem to corroborate the trend of visibly falling fertility in the 1990s. Similar conclusions have been reached in the study of period parity progression rates derived from the 1992, 1997, and 2001 surveys.[3] All three charts show a large drop of fertility in 1990-91 and a slower downward trend with some slight oscillations in the following years. The drop in the ASFRs for age group 20-24 and 25-29 during 1991 is particularly steep. Some figures have it continuing in 1992. Tightened policies for late marriage, the new abortion and sterilization campaign waged in 1991, as well as a host of new measures for preventing unauthorized second births might explain it. Whereas delayed marriages would affect the ASFR for age group 20-24, the drop of fertility rates in the following age brackets would mainly be due to averted second and higher-order births.

If our conclusions would be based on the fertility surveys exclusively, all matters would be clear. But they are not. A look at the age-specific fertility rates from the annual NBS surveys already shows some first cracks in the picture. As these data hail from rotating sample surveys with case numbers up to 160 times as large as the recent fertility surveys, they can make a claim to greater credibility. As demonstrated by the charts, the NBS surveys have a good fit with the fertility surveys in the ASFRs for age groups 20-24 and 30-24. However, they show significant discrepancies in regard to age group

Charts 1 a-c







Sources: Survey 1982: Quanguo 1‰ renkou shengyulü chouyang diaocha fenxi 1983; survey 1988: Liang Jimin and Chen Shengli 1993; survey 1992, birth histories and reverse survival: Jiang Zhenghua 1995; survey 1997: Guo Zhigang 2000b; survey 2001: Zhang Guangyu 2004 ; annual NBS surveys: ZRTN 1992-; 2000 census: Zhongguo 2000 nian renkou pucha ziliao

[3] See Guo Zhigang 2000a and Ding Junfeng 2004.

25-29. This is the group where the largest number of second and higher-order births is concentrated. Strange enough, the 1995 micro-census, which again surpasses the annual NBS surveys in sample size, has the differences almost vanishing completely, before they re-emerge one year later. The 2000 census shows much reduced ASFRs for the age group 25-29, too.

It should be stressed that the figures from the annual sample surveys as shown in the charts are unadjusted figures. Together with the results of the fertility surveys, they have been doubted by demographers and rejected by the NBS on account of ever greater problems in survey implementation, repeated cases of large-scale fraud, and ensuing doubts on the reliability of the spectacularly low figures.[4]

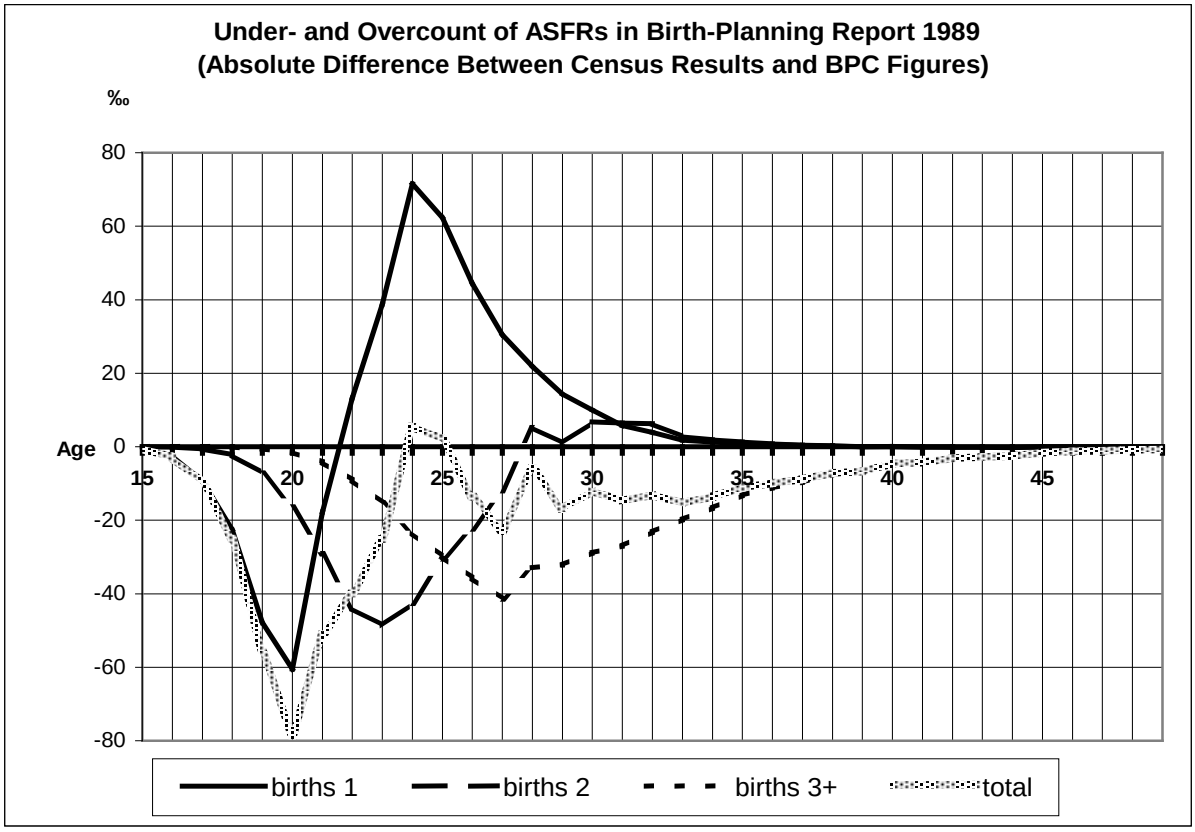
A hint at both the scope and the character of the problems encountered can be deduced from a look at chart 2. It compares ASFRs from another source, the 1989 figures of the Birth-Planning Commission's (BPC) regular report system, with the 1990 census results for births in the preceding year. The detailed data permit a precise analysis of the situation for different birth orders and one-year cohorts. These are clearly the preferable units of analysis, as the conventional summary for five-year age groups hides important patterns. The chart shows curves for over-reporting and under-reporting in the BPC report that ensue, if the results from the BPC reports are deducted from the census figures. This permits a judgment of the overall impact of age-specific misreporting. Rates for its relative extent are given in the text.

A large relative undercount of births for women bearing children under the official limits for late marriage at age 23 and late birth at age 24 shows up. The percentages of the undercount range between roughly 63% for 20 year old women, 28% for women aged 21 and 18% for those 22 years of age. Such differences are no longer negligible since the absolute numbers of births in these cohorts jump up from the very low ranges recorded for age groups 15-19; for women aged 22, they already approach the peak levels reached for ages 23 and 24. In age groups 23-26, when first births become permissible, the undercount stays small or even turns into a slight overcount, before

[4] See among many others: Zeng Yi 1995; Wang Qian and Wang Haidong 1995; Jia Tongjin and Sai Yin 1995; Zhang Weimin, Yu Hongwen and Cui Hongyan 1997. Compare also the repeated reports of cases of data manipulation and under-registration in ZJSN 1986-. For relevant foreign studies see: Scharping 1995; Attané and Sun Minglei 1998; Merli 1998; Merli and Raftery 1998; Attané 2000; Scharping 2003. For a differing view on the reliability of recent birth figures: Zhang Guangyu 2004; Guo Zhigang 2004a.

undercount increases again with age 27, a threshold for having a second child. Underreporting amounts to more than 20% in age groups 27-34.

Chart 2



Sources: own calculations from original data in JJSN 1990-91; ZRTN 1992-93

An analysis of figures for individual birth orders is equally revealing. Apart from the usual, extremely high undercount among women aged 15-19 (90%), there is also serious overcount of first births. It starts in the age group 22, where it amounts to roughly 10%, and it rises further to 100% in the age groups 29-32. Thereafter, the overcount falls to levels of ca. 50%, before new undercount develops. The figures can be explained as early births reported later and second births registered as first ones. Furthermore, there is a very high undercount of second births, which make up one third of all births in 1989. For women aged 20-27, average underreporting amounts to 65%. With age 28, when second-child applications become permissible, there suddenly starts an overcount. The largest undercount can be detected for third and higher-order births, which comprise 18% of all births in 1989. The relative extent of underreporting is particularly huge before reaching age 28 and amounts to roughly 90%. Later on, approximately 75% of higher-order births are missed.

The rates of under- and over-reporting discussed here are not necessarily correct. Survival rates calculated for children in the young age groups from both earlier data and the corresponding cohorts at the time of later enumerations always raise the earlier birth totals, as they show a larger number of survivors than the births reported before. Misreporting in 1989 therefore was even higher than shown in chart 2. How it has developed after the tightening of birth-planning policies in the 1990s is open to debate and cannot be determined definitely. But the survival rates calculated in table 1 indicate that the problems may have continued and that the well-known, perennial problems of the BPC report system may have spread to other enumerations and contaminated all birth data. Of course, the survival rates suffer from the defect that

Table 1
Survival rates for cohorts born since 1979 from census and microcensus

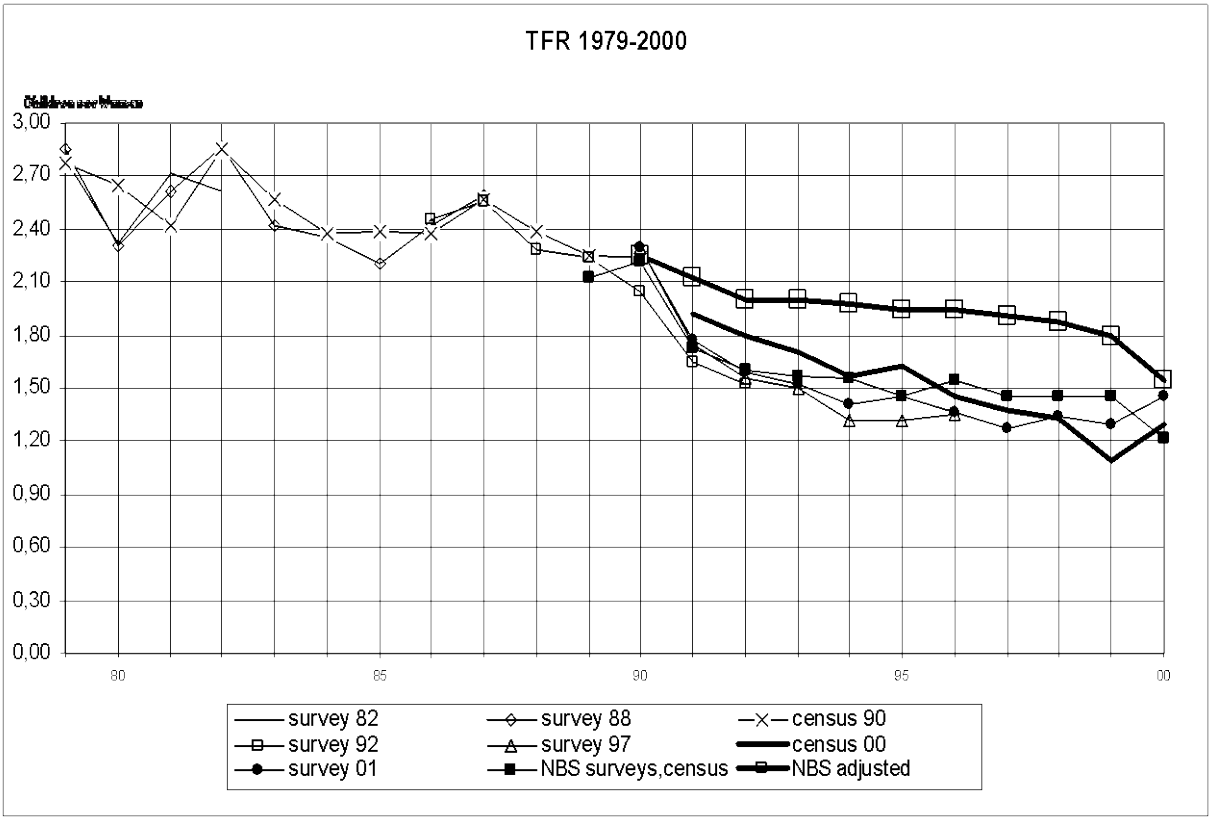
	intercensal period				
	1982-1990	1982-2000	1990-1995	1990-2000	1995-2000
cohorts by year of birth					
1994/95					1.05
1993/94					1.13
1992/93					1.05
1991/92					1.02
1990/91					1.01
1989/90			1.15	1.14	1.00
1988/89			1.12	1.08	0.97
1987/88			1.07	1.05	0.99
1986/87			1.09	1.05	0.96
1985/86			1.09	1.05	0.97
1984/85			1.07	1.03	0.97
1983/84			1.05	1.07	1.02
1982/83			1.06	1.06	1.01
1981/82	1.09	1.10	1.03	1.01	0.99
1980/81	1.06	1.13	1.08	1.07	1.00
1979/80	1.06	1.05	0.98	0.99	1.02
1978/79	0.99	0.99	0.99	0.99	1.01

Sources:
own calculations from census and microcensus data for population by age and sex, adjusted for the military, comparable reference dates and life table mortality (based on intercensal schedules for periods 1982-90, 1990-2000, calculated from 1982, 1990 and 2000 census life tables, the latter from Banister 2003; for the periods 1982-2000 and 1990-95 the 1990 census life table was used; for the period 1995-2000 the 2000 life table was used)

large problems have been discovered in the age-structure of both the 1995 micro-census and the 2000 census.[5] Using these data for the correction of earlier figures therefore creates a conundrum since one set of defective data is used for judging another set of defective data. A final judgment will only be possible, once a new census comes up with better data, and sufficient time has passed to cancel out the effects of intentional or accidental misreporting.

The overall picture resulting from this unclear situation is shown in chart 3. It demonstrates how treacherous the fertility record for the 1990s has become. The chart plots the total fertility rates resulting from the summed up ASFRs discussed above. It also contains two further curves that have been calculated from either the 2000 census figures for population aged 0-14 or from adjusted birth rates as published by the NBS. While the curve from census figures by and large resembles the fertility survey data, the adjusted line would signal large-scale under-reporting.

Chart 3



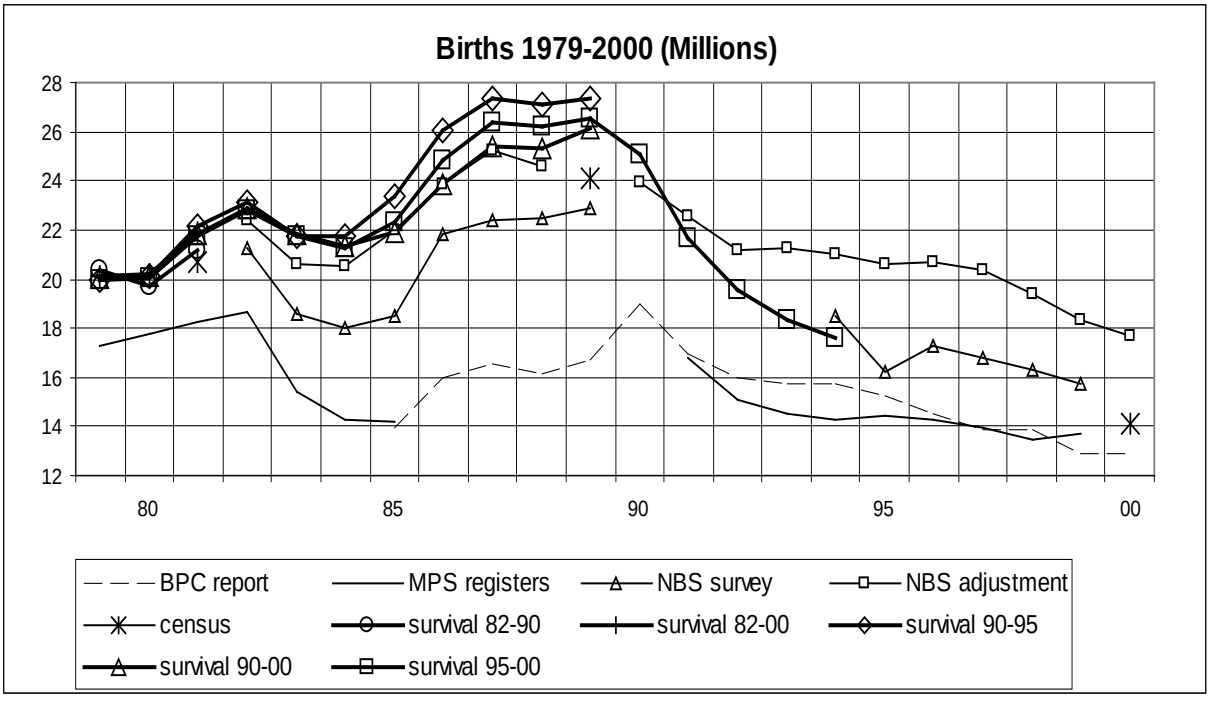
Sources: see note to charts 1a-c and Yu Xuejun 2002, Zhang Weimin and Cui Hongyan 2003, Ding Junfeng 2003

[5] Zhang Weimin, Yu Hongwen and Cui Hongyan 1997; Cui Hongyan and Zhang Weimin 2002; Yu Xuejun 2002; Zhang Weimin and Cui Hongyan 2003.

The method of adjustment has been sketched in regard to the 1995 micro-census results. It there rests on substituting the surveyed low-age cohorts of the running year with birth figures from earlier sample surveys, deriving a rate of adjustment and applying it to the TFR. Birth-order proportions and the pattern of ASFR contributions are assumed to be unchanged. But what if these patterns have changed, or if the substituted birth figures are defective, too? We here enter a circular argument, since all adjustments have to ultimately assume the correctness of at least some data. And this seems to be problematic in the given situation. How volatile the base for judging fertility developments during the 1990s has become, can be gleaned from chart 4.

The chart and the accompanying table present absolute numbers for births derived from some of the data sets discussed above. They also add further time series for comparison. These originate from the BPC annual report system and the Ministry of Public Security's household registers. No serious demographer would use these data, since for many years both systems have been known to suffer from serious under-reporting of births. But the gap between their figures and the other data remind us once again of the immensity of the problems encountered in the enumeration of births. Even though differences in the procedures for birth enumeration exist, the problems of truthful household registration and birth-planning records are essentially of a similar nature as the difficulties met during the 2000 census, which produced equally reduced birth numbers.

Chart 4:Birth numbers from different official sources 1979-2000 (Million,calendar year)



	BPC annual report	MPS registers	NBS annual survey	NBS adjustment	census	from reverse survival rates 1982-90	1982-2000	1990-1995	1990-2000	1995-2000
		17.27				20.35	20.09	19.96	20.01	19.93
80		17.79				19.69	20.18	20.15	20.10	20.02
		18.24			20.69	21.15	21.93	22.19	21.85	21.76
		18.68	21.26	22.38				23.15	22.87	22.78
		15.41	18.59	20.58				21.76	21.83	21.75
		14.26	18.02	20.55				21.72	21.38	21.30
85	13.93	14.16	18.51	22.02				23.39	21.94	22.35
	15.98		21.83	23.84				26.05	23.94	24.88
	16.55		22.40	25.22				27.36	25.42	26.38
	16.15		22.47	24.57				27.10	25.32	26.21
	16.71	18.07	22.88		24.07			27.32	26.19	26.57
90	18.95		23.91	23.91						25.08
	16.97	16.81	20.49	22.58						21.58
	15.96	15.10	19.40	21.19						19.52
	15.70	14.52	18.45	21.26						18.34
	15.75	14.28	18.05	21.04						17.59
95	15.21	14.40	16.89	20.63						
	14.55	14.30	17.72	20.67						
	13.88	13.95	17.09	20.38						
	13.83	13.43	16.69	19.42						
	12.88	13.67	16.13	18.34						
00	12.92			17.71	14.11					

Sources:
own calculation of NBS annual survey figures for 1990-94, 1996-99 from published fertility rates and projection of women aged 15-49;
Birth-Planning Commission (BPC) reports: ZJSN 1986- ; Ministry of Public Security household registers: ZRTN 1988-, ZFN 1992; NBS annual surveys: ZRTN 1988-; for microcensus 1995 see: Zhang Weimin, Yu Hongwen and Cui Hangyan 1997; NBS adjustments: ZRTN 1988-; 2000 census: Zhang Weimin, Yu Hongwen and Cui Hangyan 1997; NBS adjustments: ZRTN 1988-; 2000 census short-form data: Zhongguo 2000 nian renkou pucha ziliao, Vol. I, III; own calculations for reverse survival from census and micocensus data

If NBS adjustments are taken as 100, the implied rates of under-reporting in the BPC reports would range between a low of 20.7 % in 1990 and a high of 31.9 % in 1997. The average for the whole decade would be more or less the same as during the 1980s. Birth numbers calculated by reverse survival from the rates shown in table 1 would enlarge the difference still further for the 1980s, while they would reduce it for the first half of the 1990s. These corrections look more reliable for the earlier years where the adjusted numbers are based on age groups 10-21 of the 2000 census. Although these age groups may also suffer from distortion due to misreporting of migrants, the bias is probably less than in the age groups 5-9 that are used for the correction of births during the early 1990s. Once again the conclusion is that the issue can only be settled by the next census in 2010.

3. Analysis of Primary School Data

In view of the obvious deficiencies of regular birth enumeration and the limits of checking their veracity by conventional demographic methods, the study of data for primary-

school enrollment and their comparison with the birth records constitutes an alternative way of investigating recent Chinese fertility developments. It exploits independent sources that should be free from the distortions of many population figures. But as they hail from another bureaucratic system with its own problems, they must be used with a critical mind all the same. In contrast to many other developing countries, China boasts almost universal enrollment of school-age children at the primary level. Close relationships should therefore exist between the number of school entrants or students in the first grades during a given year and the birth figures for the corresponding earlier years. The relationships should be all the closer since, by conventional reasoning, unreported births are resurfacing once access to schooling is claimed and proper documents have to be submitted.

Because of these properties, school enrollment figures have been frequently cited as a source of reference for calculating rates of underreporting in earlier birth reports. However, most attempts at studying them have confined themselves to brief allusions only. More thorough analyses have recently been presented in Zhang Weimin and Cui Hongyan 2003, who compared school entrance data for 1997-2002 with age groups 4-9 from the 2000 census, and in Liang Zhongtang 2003, who extended these calculations to the period 1984-1996 and included the census age groups 4-16. Both analyses agree as far as the basic method of comparison is concerned. Nevertheless, Liang Zhongtang's total number for underreported children in the census age-groups 4 to 9 (28.13 million) is more than 8 million higher than the calculation by Zhang Weimin and Cui Hongyan (19.96 million). This difference is equal to more than 40 %. It mainly arises, because in one case universal school enrollment is assumed, whereas in the other an attempt at estimating the number of non-enrolled children and including them in the overall assessment is made. The discrepancy alerts us to the necessity of submitting the school data to closer scrutiny and studying some procedural and definitional matters connected with them. This necessity is further underlined by the fact that both studies work on the basis of further assumptions: accuracy of school entrance data and their freedom from the prevalent bias in birth numbers; a comparable reference time for the calculation of school age; a uniform school entrance point at 6 years of age; no major role of drop-out figures during the first year in school. As will be shown, some of these assumptions are problematic.

Besides school enrollment data, census and micro-census data constitute another relevant source. They are confined to figures on the educational attainment of the population at and above 6 years of age and can be further specified for individual age groups. Most important among these are figures on children in the age groups targeted for school entrance. If their educational attainment is reported as "primary-school level" in the census questionnaire, this signifies persons with any kind of primary-school experience, including not only graduates but present students in primary school, drop-outs and leavers without proper examinations.[6] A number of other sample surveys also include educational information, but usually their figures are either too localized or not specific enough for purposes of demographic evaluation. The database for educational statistics is therefore more or less limited to the regular ministerial data and the intermittent census results.

The regular educational data used in the authoritative *China Statistical Yearbook,* however, have never been directly surveyed or enumerated by the NBS but hail from the Ministry of Education. Since 1987 the Ministry publishes them also in its official *Yearbook of Chinese Educational Statistics*.[7] This publication provides a much fuller record than available in the commonly used *China Statistical Yearbook.* An extract is also released in the annual *Communiqué of Educational Statistics* that can be accessed on the Ministry's website. Usually, a selection of the ministerial statistics is reproduced by the NBS without further changes. We have to take note of the fact, however, that two figures, i.e. the total number of school-age children and the subtotal of those of them who are effectively enrolled in school, have been for the first time reported differently in recent years.[8] The difference is not explained, but it most likely results from the change to a new ministerial report system in 2001 that may make former numbers incomparable. Similar confusion can be observed in earlier data for the late 1980s, after the Ministry effected some other changes in its report system during 1991. It is therefore prudent to confine the discussion of some figures to the period 1991-2000 for which a unified set of figures is available.

[6] See the definitional explanations published together with the census results.

[7] ZJSTN 1987-

[8] ZTN gives the total number of school-age children for 2002 as 113.104 Million, while ZJSTN records 107.570 Million. The subtotal of school-age children enrolled in primary school is given as 111.500 and 106.046 Million, respectively. In both cases the difference amounts to ca. 5.5 Million. The situation in 2001 is similar.

Besides the indicators already mentioned, the following regularly published data seem to be of particular relevance for purposes of demographic evaluation: the annual total of school entrants (excluding repeaters of the first grade); the annual total of primary-school students (including entrants of the new school year but excluding graduates and other school leavers from the last school year); the annual total of enrolled school-age children (until 2000 with specifications for individual age groups); the net enrollment rate (enrolled school-age children as a percentage of the total number of school-age children); the gross enrollment rate (including students under or above the official school-age limits); the drop-out rate (students missing from the student total at the beginning of the year, excluding transferred or non-enrolled children). In principle, all these data are regularly collected by the local schools and school administrations which forward them to upper levels via the formalized channel of regular report forms submitted at year end. They refer to the beginning of the school year on September 1. Covered are all ordinary primary schools, including those run by the government, those run by collective units, enterprises or village communities, and those run by private persons and organizations. Not included are primary schools for illiterate adults, children in kindergartens or pre-school classes, and students enrolled in special schools for the deaf, blind and mute.[9] Except the demographically insignificant last category, this universe is all-inclusive and should match the needs of demographic analysis.

Besides basic definitional matters, it is also useful to consider some procedural questions involved. The Law on Compulsory Education from April 1986 requires all children who have completed their sixth year of life to enter school, but it explicitly gives local areas the right to defer the time of school entrance until the formerly valid standard of 7 years of age. National implementation rules from March 1992 specify that provinces have the right to decide the proper school entrance time on their own. The provinces, autonomous regions and centrally administered cities in turn transfer this right to counties and urban districts. The same holds true in regard to the system adopted for realizing the prescribed nine years of compulsory school education: it can be either six years of primary school and three years of junior high school (6-3 system), five years of primary school and four years of junior high school (5-4 system), or nine years in a unified schooling scheme (unified 9 year-system). Most prevalent is the 6-3 system.

[9] For basic conventions observed in educational statistics see the relevant information in ZTN, as well as Li Chengrui 1986, Jiaoyubu yiwu jiaoyu jiance xiangmu gongzuo jianbao 2002, Hunan-sheng jiaoyu-ting zai 2003 nian

Some further information on the prevailing situation can be gleaned from provincial implementation rules passed between 1986 and 1998. At present, four provinces (Inner Mongolia, Guizhou, Ningxia, Qinghai) stipulate normal school entrance at age 7; three others (Tibet, Shaanxi, Gansu) adopt this age limit for their rural areas. All other provinces specify normal school entrance at age 6, but allow counties and urban districts to delay until age 7. Five provinces (Inner Mongolia, Guangxi, Guizhou, Yunnan, Xinjiang) permit a delay until age 8; two (Tibet, Qinghai) even allow a delay until age 9.[10] Most rules envisage a gradual transformation to universal school entrance at age 6, but no representative information is available on the present state of implementation at local levels.

Under conditions as such children of primary-school age can be 6 to 10 or 11 years of age, and 7 to 11 or 12 years of age, respectively. As not all families observe the regulations, a certain number of primary-school students will also be outside the proper age brackets. It is important to know that until 1990 the total numbers for school-age children were calculated uniformly with reference to the age group 7-12. Ever since, the total of school-age children is reached by summing up local numbers defined by different regulations on age limits and school system. It is worth noting that local educational departments calculate the total number of school-age children from birth numbers obtained from birth-planning departments in townships and towns. For enrollment purposes, the precise names of the children will be checked in the local household registers, before public announcements are posted and parents are notified. Preparations for the enrollment of new entrants start in spring, and their registration usually takes place in June or July.

While implementation of the new Law on Compulsory Education first lagged, new initiatives have attempted to put it into practice since the end of the 1980s and the early 1990s. Among them are the Project Hope, since 1989 under the sponsorship of the Communist Youth League, an ambitious campaign announced in 1992 for the realization of the Two Targets – the eradication of illiteracy and the achievement of nine years of school throughout the country until 2010 - , a special program started in 1995

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[10] Zhonghua renmin gongheguo yiwu jiaoyu-fa, 12 April 1986; Zhonghua renmin gongheguo yiwu jiaoyu-fa shishi xize, 14 March 1992. Also checked were all presently valid provincial Shishi "Zhonghua renmin gongheguo yiwu jiaoyu-fa" banfa.

for spreading education to the country's poverty regions, and state stipends extended since 1997 for supporting school attendance in poor minority regions.

Many figures show the impressive impact of these campaigns. They are credited with having increased primary school attendance by 12 million children during 1994 to 1997 and with having halved the number of drop-outs in that period from 2.3 million to 1.3 million. The great majority of Chinese counties, cities and districts with ca. 85 % of the total population is supposed to have successfully established compulsory nine-year education.[11] Whereas the net enrollment rate is claimed to have risen further from the already high 97% in 1991 to 99% in 2000, regularized school attendance seems to have brought gross enrollment down from supposedly 121% in 1991 to 105% in 2000. Drop-out rates are reported as below 1% and concern mostly older children. The formerly wide regional variations have narrowed. Besides minority nationals and poor peasants in the usual problem areas of the country, only rural migrants have been identified as a still remaining problem group with larger numbers of non-enrolled children at primary-school level. In November 2003, the Chinese press reported that in a sample survey of migrant children in nine cities, 9 % of them had either broken off their studies or had never entered school, while 50 % were over-aged with delayed school entrance. 20 % of the nine-year olds had only attended the first two grades; 31 % of the children aged 13 and 10 % of those aged 14 were still in primary school.[12]

There can be no doubt that educational expansion has made big advances. Nevertheless, some caution is due in regard to the extremely high levels of some indicators and achievement reports. Just as the birth-planning campaign, the drive for the realization of the Two Targets has worked with a set of mass campaign techniques: signed obligations, cadre evaluations with threats of wage deductions, emulation campaigns between different counties. It is well-known that the campaign has created many problems in the funding of rural schools such as run-up debts of county and city administrations, unpaid teacher's salaries, illegal school fees raised from unwilling peasants, and intentional misreporting of statistical indicators for school finances and school buildings that are used for regular evaluation purposes. It would be a miracle if the enrollment rate and the drop-out rate, which are likewise used for evaluation purposes, would not be effected by these problems. The Ministry of Education therefore

[11] www.hoho.edu.cn/history/blue-book/hopepr/yyff.htm; www.ccyl.org.cn/zuzhi/documents

[12] ZTN 1986-, ZJSTN 1987-; Zhongguo qingnian bao, 6 November 2003; Guan Ruijie 2001

started a new program for combating statistical fraud and double-checking the accuracy of some figures. But not only has double-checking suffered from lack of funding. It has also produced the problem that in many cases the investigators just copy figures from existing records instead of conducting personal surveys in rural households on the spot. For anyone knowledgeable about the situation of population statistics, these problems look familiar.[13] Even though misreporting in educational statistics is certainly not of the same magnitude as in birth statistics, it is prudent to treat some of the claimed indicator levels, in particular the enrollment and drop-out rates, with reservation.

Nevertheless, the indicators that are most important in the context of this study are reproduced in tables 2 and 3, in order to make them available for further scrutiny and to allow a checking of the argument presented in this paper. Table 2 provides the official figures for children of school age and the enrollment rates derived by combining them with age-specific enrollment figures. Distortion of these figures can arise under three circumstances: 1) the numerator with the children in school is artificially raised, if the numbers are over-reported for evaluation purposes; 2) the denominator with the total number of school-age children is lowered, if sources for obtaining these data such as the household registers and the birth-planning files are defective; 3) both numerator and denominator are wrong.

Table 2

Official data for children of school age (millions) and enrollment rates (%)

	children of school age 7-11	children of local school age	enrollment rates net 7-11	net,local age	gross,local age
90	97.407		97.8	96.3	111.0
	98.066	102.436	97.8	96.8	109.5
	99.671	111.560	98.0	97.2	109.4
	102.436	114.320	98.3	97.7	107.3
	106.342	119.496	98.7	98.4	108.7
95	111.584	123.754	98.7	98.5	106.6
	116.541	128.765	99.1	98.8	105.7
	120.624	133.467	99.2	98.9	104.9
	119.632	133.693	99.3	98.9	104.3
	114.707	129.914	99.5	99.1	104.3
00	108.097*	124.453	99.5	99.1	104.6
		106.735**/117.664***	99.1	99.1**/98.3***	104.5
		107.670**/113.104***	99.3	98.6	107.5

* = census figure; ** = ministerial figure; *** = NBS figure

Sources: ZJSTN 1990-; ZTN 1990- ; own calculation for children of school age 7-11during 1994-99 from official net enrollment rates and data of students by age

[13] See sources under note 9 and Li Jianke 2001

Table 3 reproduces the official data for school entrants, enrollment totals and school-age students by age group. For the interpretation of the figures it is important to know that the enrollment totals exceed the sum of the age groups, because 11 % (1991) to 5 % (2000) of the students are under-aged or, far more frequently, over-aged. Moreover, students listed under the individual age groups comprise only those within school-age limits. This may create problems in the use of figures for those aged 12 or 13 as there are other students in these age groups who are outside the age limits.

Table 3

Official primary school figures (Millions)

	entrants	student total	age 6	age 7	age 8	age 9	age 10	age 11	age 12	age 13
90	20.640	122.414	4.667	18.751	20.659	18.980	18.284	18.624	22.451	
	20.727	121.642	0.714	18.518	19.624	20.875	19.056	17.875	11.099	
	21.832	122.013	0.992	19.404	19.311	19.707	20.873	18.339	9.845	
	23.535	124.212	0.985	21.335	20.277	19.458	19.671	19.966	10.014	0.003
	25.370	128.226	1.184	23.599	22.340	20.476	19.527	19.017	11.435	0.003
95	25.318	131.952	1.354	23.564	24.571	22.527	20.597	18.874	10.435	0.004
	25.247	136.150	1.356	23.892	24.380	24.798	22.533	19.890	10.380	0.004
	24.620	139.954	1.222	23.994	24.632	24.465	24.809	21.759	11.141	0.003
	22.014	139.538	1.277	21.164	24.558	24.728	24.465	23.881	12.196	0.000
	20.295	135.480	1.320	19.328	21.728	24.741	24.745	23.592	13.273	0.002
00	19.465	130.133	1.485	18.424	19.893	21.910	24.794	23.906	12.926	0.001
	19.442	125.435								
	19.528	121.567								
	18.294	116.897								
	17.470	112.462								

Sources. ZJSTN 1991-

On the background of the above information, the following conclusions can be reached for the use of school data:

1) Entrance figures for primary schools should be rejected in demographic analysis, because they cannot be assigned to a definite age group. Since many children still enter primary school at age 7 or even older, the practice of taking them to mean children aged 6 is untenable. Data from the 2000 census show only 80 % of the six-year olds in school. But as the census results themselves are under doubt and other precise and representative information on the age structure of entrants is lacking, percentages for the various age components cannot be reckoned either.

2) Total numbers for school-age children and the net enrollment rate should be likewise discarded. They derive from doubtful sources such as the local birth-planning records and household registers. Using them would open a circular argument as birth-planning data would be appraised by birth-planning data.

3) School enrollment totals are equally unusable, because their universe is too amorphous and blurred by different age limits for school entrance and exit.

A better alternative are clearly the Ministry of Education's enrollment figures for individual age groups. They can be combined with census information on the educational attainment of age groups 6-11 as given table in table 4. Even though the figures may be biased, they once again show the great improvements in Chinese educational levels since the preceding census in 1990. That earlier count yielded much lower percentages for children with primary-school attainment in the lower age groups. They amounted to 41.3 %, 75.8 % and 91.2 % for age groups 6, 7 and 8, respectively. Age groups 9-11 stayed at a level of 94 % to 96 %.

Table 4

	2000: ministerial statistics			2000: census			
	Students	Age group	Enrollment	Age group	educational attainment		
					primary school	any school	
	Million	Million	%	Million	Million	Million	%
Primary school entrants	19.465						
Primary school enrollment	130.133	149.143*	87.3				
children of school age 7-11	108.927	109.475**	100.8/99.5	108.097	104.734	106.615	
children of school age 6/7-11/12	123.339	124.453	99.1				
age 6	1.485		9.0	16.470	13.186	13.186	80.1
age 7	18.424		102.8	17.915	17.284	17.284	96.5
age 8	19.893		106.1	18.752	18.469	18.469	98.5
age 9	21.910		109.1	20.082	19.864	19.891	99.0
age 10	24.794		94.6	26.210	25.803	26.008	99.2
age 11	23.906		95.1	25.138	23.315	24.963	99.3
age 12 (and over)	12.926		52.6	24.576	17.066	24.402	99.3
age 13 (and over)	0.001		0.0	26.283	10.166	26.090	99.3
Sum	123.339				145.152	170.292	

Notes: * = revised; ** = own calculation from enrollment rate

Sources: ZJSTN 2000; census materials

Census figures for educational attainment comprise both graduates, school leavers without proper examinations and students enrolled at a given level. For all purposes,

there are no graduates among children in the low age groups. Drop-out rates also stay low under age 11. The census figures on educational attainment can therefore be taken to mean students in school and compared with the Ministry's of Education enrollment figures for individual age groups. This enables us to reach some further conclusions:

4) Enrollment figures for 6 year-old children from the ministerial statistics are abnormally low and highly incomplete. They neither square with descriptive and normative information on rules for school-entrance age, nor do they conform to trends in educational attainment between the 1990 census and the 2000 census. If they are matched with the 2000 census results, a much larger number of six year-old children in primary school shows up in the census data (see tables 3 and 4). It is tempting to replace the school data for students aged 6 with the census data. But as the census figures themselves are under doubt, they should not be used for substitution either.

5) Clearly better results are obtained, if primary school students aged 7-11 are compared with the corresponding figures for age-specific educational attainment. The numbers are close, so that school enrollment data for the age groups 7-11 will be accepted. However, they need to be adjusted for non-enrollment. This is done by comparing the growth and shrinking of school cohorts over the years. Students aged 7 in year (x) should be aged 8 in year (x+1), aged 9 in year (x+2) etc. etc. It turns out that during the period 1991-2000 the school cohorts grew by averages of 3-4% from age 7 to 8, nearly 1% from age 8 to 9 and only imperceptibly from age 9 to 10. From age 10 to age 11 they shrunk again by ca. 4%. This is interpreted as indicating the extent of non-enrollment in the appropriate age groups. In a strict sense, the conjecture is a simplification as drop-outs, re-entrants and school leavers enter the picture, too. From the 1990 census materials it is known, however, that the numbers for these groups are very low during the first grades and increase only with age 11 and later stages of school life.[14] On this basis, enrollment is estimated to amount to 95% for age

[14] Drop-outs are a subgroup of non-enrolled children. Their numbers thus should not be added to the calculated non-enrollment total. Still, they display a clear pattern that can be checked for conformity with the non-enrollment estimate. Own calculations from the 1990 census show a good fit with the assumed pattern of non-enrollment; drop-outs in 1990 amounted to 0.05 %, 0.08 %, 0.16 %, 0.36 %, 0.79 %, and 1.62 % of primary-school attainment for the six age groups 6 to 11, respectively. Although the census group of school leavers without proper examinations is not fully identical with drop-outs, the difference is statistically insignificant. No similarly precise data are available from the 2000 census. It is assumed, however, that the figures have either improved or have at least not deteriorated.

group 7, 97% for age group 8, 98% for age groups 9 and 10, 96% for age group 11.

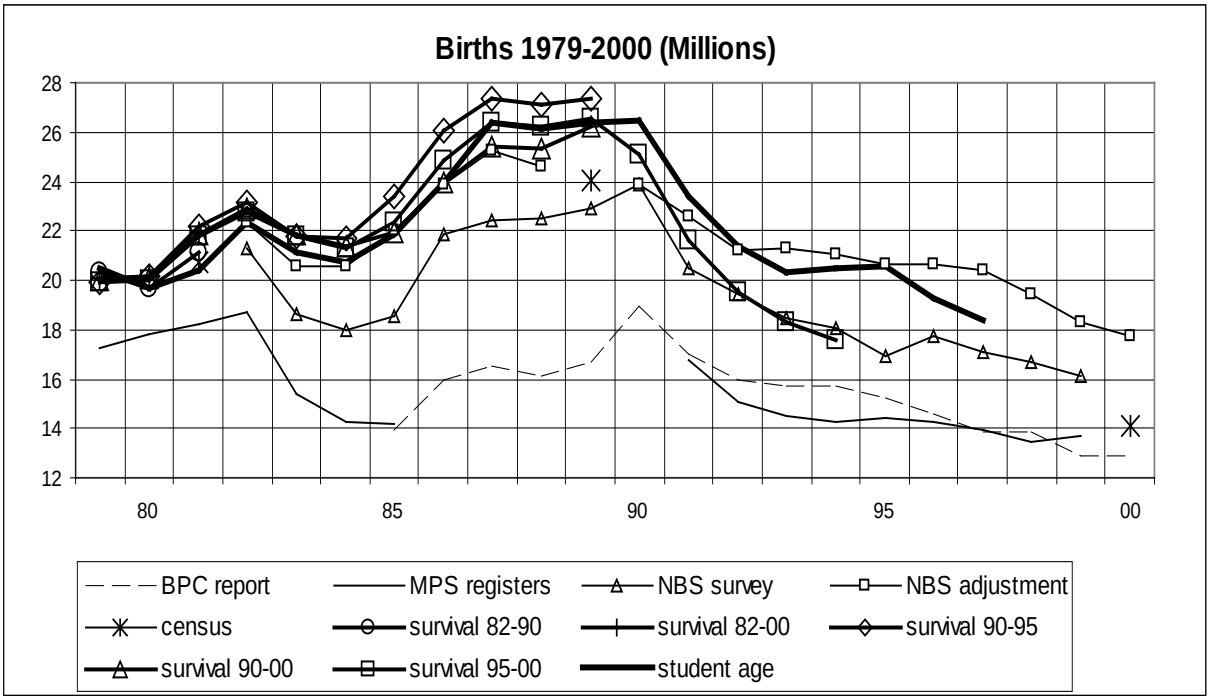
6) Because a significant number of students aged 12 and 13 either progress to junior high school or discontinue their studies, the primary-school enrollment data for these age groups are very low and cannot be used for demographic analysis.

7) The publication of age-specific school data used for the calculation breaks off after 2000 and therefore does not allow further estimates for the years after 1993. Weaker approximations must therefore be used for stretching the calculation of birth numbers from school data beyond 1993. It thus can be observed that in the period 1996-2000 the number of enrolled students aged 7 amounted to between 97.5 and 94.1 of all annual primary-school entrants, with an average of 95.6 %. If this percentage is applied to the school entrants of 2001 to 2004, approximate figures for students aged 7 in the years 2001 to 2004 can be calculated. These numbers then can be used for deriving the number of births, adjusted for mortality and enrollment rate.

4. Conclusion

On the strength of the above conclusions, we can use school enrollment data for age groups 7-11, adjusted for non-enrollment and mortality, to calculate births in the corresponding earlier years by the reverse survival method. The results are shown in chart 5 and the accompanying table. While not fully conforming with other time series on births, they tend to confirm rather high upward revisions for fertility data from the birth-planning and household registration systems. There is a reasonably good fit with revised birth data based on reverse survival rates except for the years 1981 and 1984 (revisions from school data are lower than revisions based on reverse survival from census materials) and 1990-94 (revisions from school data are progressively higher). The school data would necessitate a large upward revision for births during 1989 and the census year 1990. Thereafter they would confirm a plummeting of birth numbers during the early 1990s. Because cohort sizes of women in the high-fertility age groups 20-29 stayed large, it must have been caused by falling fertility, most likely a decrease of first births in the age groups 20-24 and a massive drop of second and higher-order births in the age groups 25-29. The noticeable rise of the marriage also played a

Chart 5



Births calculated from primary school data (Millions)
(adjusted for mortality and enrollment rates)

	from student age groups					
	7	8	9	10	11	average
1979					20.50	20.50
1980				19.70	19.67	19.68
			20.43	20.53	20.18	20.38
		22.45	22.47	22.49	21.97	22.35
	20.79	21.33	21.22	21.19	20.93	21.09
	20.45	20.90	20.86	20.95	20.68	20.77
1985	21.43	21.95	21.95	22.09	21.79	21.84
	23.56	24.18	24.15	24.17	23.84	23.98
	26.06	26.59	26.58	26.61	26.16	26.40
	26.02	26.39	26.23	26.24	25.85	26.14
	26.32	26.59	26.44	26.47	26.12	26.39
1990	26.43	26.51	26.45	26.52		26.48
	23.31	23.45	23.42			23.40
	21.29	21.47				21.38
	20.29					20.29
	20.47					20.47
1995	20.56					20.56
	19.26					19.26
	18.40					18.40

decisive role.[15] Nevertheless, the number of births would not reach quite as low a level as indicated by other data. If the school data are accepted, they would indicate persistent underreporting of births in the range of roughly 25 % (in the regular birth-planning report data), 28 % (in the regular household registration data), or 10 % (in the

[15] Guo Zhigang 2004a.

unadjusted annual NBS figures) during 1991-97. The difference to the reverse projections from 2000 census materials is an average 9 % during 1991-1993 but increases to 19 % for 1997. [16] This confirms the tendency of census and survey records to suffer from growing underreporting in the very young age groups.

It is also instructive to compare the school numbers with the controversial birth adjustments of the NBS. For the years 1982-86 and 1992, the school data come extremely close to the revised birth numbers released by the NBS. For the years 1987-91, they exceed even these by 5 % to 10 %. Since 1993, however, the NBS adjustments look too high, and their excess in relation to the school data grows to more than 10 % in 1997.

The school data and the absolute birth numbers derived from them in table 5 can finally be used to estimate total fertility rates in accord with them. The calculation depends on a number of unreliable data and therefore moves within a certain range. A reverse projection of women aged 15-49 from 2000 census materials thus leads to lower figures than a forward projection from the earlier 1990 census figures. Exploiting the age composition of fertility rates for the early 1990s from national fertility surveys rather than from annual NBS surveys works in the same direction, while it produces the opposite result for the mid-1990s. Higher infant mortality rates raise all estimates. Lower percentages of students aged 7 after 2000 lower the total fertility rates for the years 1995 to 1997.

The calculations produce the following ranges for the 1990s:

Table 6

Total fertility rate, calculated from school data (children per woman)

1990	1991	1992	1993	1994	1995	1996	1997
2.40-2.48	2.05-2.10	1.86-1.89	1.74-1.77	1.74-1.78	1.75-1.79	1.66-1.70	1.60-1.65

But no matter how the precise figures come out, the results appear higher than most TFR calculations from other materials, among them the 1990 census (1990 = 2.24), the 1992 national fertility survey (1991 = 1.62 - 1.65), the 1997 and 2001 national surveys

[16] For the estimate of birth numbers during the 1990s as calculated from the 2000 census materials see Zhang

on population and reproductive health (average for 1991-1996 = 1.47 and 1.52, respectively), unadjusted data from the annual NBS surveys on population dynamics (average for 1991-1997 = 1.56), reverse calculations from 2000 census numbers (average for 1991-1997 = 1.55), as well as a number of studies based on them. On the other hand, they are lower than Yu Xuejun's calculation from NBS-adjusted birth rates from the 1990s (average for 1991-1997 = 1.99) or the NBS estimate for 1995 (1.85). They are also lower than the adjustment of Retherford et al. for the TFR in 1990 (2.58), while they are higher than their estimate for 1997 (1.39 to 1.47).[17]

Although the results confirm a pronounced tendency of underreporting of births, another even more important conclusion emerges just as well: China has experienced an extremely rapid decline of birth numbers and fertility rates in the early 1990s. It continued thereafter, albeit at a slower pace. Since 1992 the total fertility rate is under replacement level, and it is possible that it continued to decline after 1997. If this trend persists, deficient rather than excessive childbearing will be the future cause of Chinese headaches.

Weimin and Cui Hongyan 2003.

[17] Zhang Weimin, Yu Hongwen and Cui Hongyan 1997; Yu Xuejun 2002; Ding Junfeng 2003; Zhang Weimin and Cui Hongyan 2003; Guo Zhigang 2004a; Guo Zhigang 2004b; Retherford et al. 2005.

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