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THE CHINESE GDP GROWTH RATE PUZZLE: HOW FAST HAS THE CHINESE ECONOMY GROWN?[*]

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ABSTRACT

The Chinese statistical authorities have recently revised the Chinese GDP level and real growth rate for the period 1993-2004 following China's first national economic census for 2004. However, their methodology used in the revision is opaque. Using a trend-deviation interpolation approach, this study has managed to replicate the basic procedures of the revision and reproduced the official estimates. Through this exercise, it has found that the estimates that could be obtained by the straightforward interpolation procedures were significantly and arbitrarily modified. Based on some political economy argument, we attempt to explain why the revision had to leave the growth rate of 1998 intact and why it had to bypass the price issue and directly work on the real growth rate revision. Based on previous studies and other observations, we also question the census results on non-service industries.

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1. INTRODUCTION

The long debate about the problem with China's GDP statistics is in essence not a question of accuracy – indeed there is no such thing as perfect national accounts in any country that could produce faultless GDP figures, but a question of how institutional or methodological problems may cause data fabrication or distortion and, more importantly, how institutional constraints may affect the improvement of statistical methodology (Wu, 2000 and 2002; Maddison, 1998; Ren, 1997; Woo, 1996; Keidel, 1992). These data problems are not only seen in the official annual estimates[1] but also in surveys and censuses. Without a doubt, allocating more public resources to conduct surveys or censuses may improve statistical coverage, hence increase the accuracy of statistics, but it alone will not be the solution to the data problems. On December 31, 2004, as one of the significant efforts to improve its growth estimates, China's National Bureau of Statistics (NBS) conducted China's first National Economic Census that covered all nonagricultural (secondary and tertiary) activities, which totally mobilized 13 million personnel with an input of nearly two billion yuan (*People's Daily* Online, December 22, 2005). While the census has discovered serious underreporting problems in service activities, the census-based revised annual GDP estimates are not less questionable than what we had before.

On December 20, 2005, after about one year's work on the census data, China's National Bureau of Statistics (NBS) announced that the census-based GDP estimate for 2004 was 15,988 billion RMB. This raises the nominal GDP level in 2004 by 2,300 billion RMB or 16.8% compared with the original estimates based on the annual statistics (13,688 billion) available in *China Statistical Yearbook* (CSY) (Table 1). Of this upward revision, 92.6 percent is attributed to services, which appears to support NBS's long concern about the under-coverage problem in the accounting of value added by services (see Xu, 2002; Yue and Zhang, 2005), and 10.4 percent to industry (by the Chinese standard of industrial classification, including mining, manufacturing and utilities, i.e. II (M) in Table 1), which seems surprisingly small given the problems found in the Chinese industrial statistics (to be discussed). There is also a 0.8 percent upward revision that is attributed to agriculture, which does not

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[1] Also known as "usual statistics" as used in the Chinese terminology, referring to statistics based on data collected through the state statistical reporting system (made of the NBS channels plus statistical offices run be various ministries) that was developed during the central planning period.

seem to fit into this nonagricultural activity-focused census. However, this revision has resulted in a positive 3.8 percent discrepancy (i.e. 92.6%+10.4%+0.8%=103.8%), or 88 billion yuan, that has to be "made up" by an unexpected downward adjustment for construction output (Panel E, II (C), Table 1).

On January 9, 2006, NBS released its revision of China's GDP level at current prices and real GDP growth rate for the period 1993-2004. This revision did not cover the pre-1993 period because of a previous output revision for the period 1978-92 after China's first tertiary census for 1992. Table 1 compares the 2004 Census-based revision of the nominal GDP figures with the former estimates by major sector in 1992-2004. It shows that the revision has raised nominal GDP growth rate from 13.9 to 17.8 per annum for services (Sector III), from 16.3 to 16.6 for industry (II (M)) and from 11.2 to 11.3 for agriculture (I). As for construction (II (C)), it has, however, lowered its nominal growth rate from 17.3 to 16.3 percent per annum. As a result, the nominal growth rate of the total GDP has been revised from 14.6 to 16.1 percent per annum for this period.

In Table 2, we further compare the revised real GDP growth rates and their implicit deflators with the original estimates. It appears that NBS has attributed the entire upward revision of real output to services, which raises the real growth rate of the service output from 8.6 to 10 percent per annum. As a result, China's real GDP growth rate has been raised from 9.4 to 9.9 percent per annum. Taking into account the nominal adjustment as reported in Table 1, this revision implies that the implicit inflation rate over this period has been raised from 4.8 to 5.7 percent per annum for the economy as a whole and from 4.9 to 7.0 percent per annum for services.

However, NBS does not explain why the 7.4 percent of the nominal revision for 2004 that is attributed to all the non-service sectors should be treated as a pure price effect. Strikingly, the real GDP growth rate for 1998 remained unadjusted at 7.8 percent, reflecting the much disputed growth performance of the Chinese economy at the height of the Asian financial crisis. Figure 1 depicts the impact of the 2004 Census-based revision on the real growth performance of China's service output and total GDP.

TABLE 1: THE RECENT OFFICIAL REVISION OF CHINA'S NOMINAL GDP LEVEL AS A
RESULT OF THE 2004 CENSUS: CONFRONTATION OF REVISED AND ORIGINAL
ESTIMATES, 1992-2004

	Total	I	II (M)	II (C)	III	Total	I	II (M)	II (C)	III
	(A) Revised Level (billion yuan)					(D) Revised Growth Rate (%)				
1992	2,664	580	1,028	142	914	23.2	9.7	27.2	39.4	26.5
1993	3,533	689	1,419	227	1,199	32.6	18.7	38.0	60.1	31.2
1994	4,820	947	1,948	297	1,628	36.4	37.5	37.3	30.8	35.8
1995	6,079	1,202	2,495	373	2,009	26.1	26.9	28.1	25.8	23.4
1996	7,118	1,389	2,945	439	2,346	17.1	15.5	18.0	17.6	16.7
1997	7,897	1,427	3,292	462	2,717	11.0	2.7	11.8	5.4	15.8
1998	8,440	1,462	3,402	499	3,078	6.9	2.5	3.3	7.9	13.3
1999	8,968	1,455	3,586	517	3,410	6.2	-0.5	5.4	3.7	10.8
2000	9,922	1,472	4,003	552	3,894	10.6	1.2	11.6	6.8	14.2
2001	10,966	1,552	4,358	593	4,463	10.5	5.4	8.9	7.4	14.6
2002	12,033	1,624	4,743	647	5,020	9.7	4.7	8.8	9.0	12.5
2003	13,582	1,707	5,495	749	5,632	12.9	5.1	15.8	15.9	12.2
2004	15,988	2,096	6,521	869	6,502	17.7	22.8	18.7	16.1	15.4
1992-04						16.1	11.3	16.6	16.3	17.8
	(B) Original (CSY) Level (billion yuan)					(E) Original (CSY) Growth Rate (%)				
1992	2,664	580	1,028	142	914	23.2	9.7	27.2	39.4	26.5
1993	3,463	688	1,414	229	1,132	30.0	18.7	37.5	61.5	23.9
1994	4,676	946	1,936	301	1,493	35.0	37.4	36.9	31.9	31.8
1995	5,848	1,199	2,472	382	1,795	25.1	26.8	27.7	26.8	20.2
1996	6,789	1,384	2,908	453	2,043	16.1	15.4	17.7	18.6	13.8
1997	7,446	1,421	3,241	481	2,303	9.7	2.7	11.4	6.2	12.7
1998	7,835	1,455	3,339	523	2,517	5.2	2.4	3.0	8.7	9.3
1999	8,207	1,447	3,509	547	2,704	4.8	-0.5	5.1	4.6	7.4
2000	8,947	1,463	3,905	589	2,991	9.0	1.1	11.3	7.6	10.6
2001	9,732	1,541	4,238	638	3,315	8.8	5.4	8.5	8.3	10.9
2002	10,517	1,612	4,598	701	3,608	8.1	4.6	8.5	9.9	8.8
2003	11,739	1,693	5,309	818	3,919	11.6	5.0	15.5	16.8	8.6
2004	13,688	2,077	6,282	957	4,372	16.6	22.7	18.3	17.0	11.6
1992-04						14.6	11.2	16.3	17.3	13.9
	(C) Change in Level (billion yuan) (= A – B)					(F) Change in Growth Rate (%) (= D – E)				
1992	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
1993	70	1	4	-2	67	2.6	0.1	0.4	-1.3	7.3
1994	144	1	12	-5	135	1.4	0.1	0.4	-1.0	3.9
1995	232	3	23	-9	215	1.1	0.1	0.4	-1.0	3.2
1996	329	4	37	-14	303	1.0	0.1	0.4	-0.9	2.9
1997	451	5	51	-19	414	1.3	0.1	0.3	-0.8	3.1
1998	606	7	63	-25	561	1.7	0.1	0.3	-0.9	4.0
1999	761	8	77	-30	706	1.5	0.1	0.3	-0.9	3.4
2000	975	9	99	-37	904	1.6	0.1	0.4	-0.9	3.6
2001	1,234	10	121	-44	1,147	1.8	0.1	0.3	-0.8	3.7
2002	1,516	12	146	-54	1,412	1.7	0.1	0.3	-0.9	3.7
2003	1,843	14	185	-69	1,713	1.3	0.1	0.4	-0.9	3.6
2004	2,300	19	240	-88	2,130	1.1	0.1	0.4	-0.9	3.9
1992-04						1.5	0.1	0.4	-0.9	3.8

Sources: The revised estimates are published at the NBS website (www.stats.gov.cn/tjdt/zygg/t20060109
_402300176.htm) following the official announcement on January 9, 2006. The former or CSY
annual estimates are available from *China Statistical Yearbook* (NBS, 2005 and earlier issues).

Notes: 1) 1992 is used as the initial benchmark that is not included in the revision. 2) Sector abbreviations: I =
primary, II = secondary that includes II (M) (manufacturing, mining, utilities) and II (C) (construction),

III = tertiary. 3) The implicit GDP deflator is expressed as percent change from the previous year. It is derived by the definition: P=V/Q, where P is price index, V is value index and Q is volume index.

TABLE 2: THE RECENT OFFICIAL REVISION OF CHINA'S REAL GDP GROWTH RATES AND GDP DEFLATORS AS A RESULT OF THE 2004 CENSUS: CONFRONTATION OF REVISED AND ORIGINAL ESTIMATES, 1992-2004

	Total	I	II (M)	II (C)	III	Total	I	II (M)	II (C)	III
	(A) Revised Real Growth Rate (%)					(D) Revised Implicit Deflator (%)				
1992	14.2	4.7	21.2	21.0	12.4	7.9	4.7	4.9	15.2	12.5
1993	14.0	4.7	20.1	18.0	12.1	16.4	13.4	14.9	35.7	17.1
1994	13.1	4.0	18.9	13.7	11.0	20.6	32.2	15.5	15.1	22.3
1995	10.9	5.0	14.0	12.4	9.8	13.7	20.9	12.3	11.9	12.4
1996	10.0	5.1	12.5	8.5	9.4	6.4	9.9	4.9	8.4	6.7
1997	9.3	3.5	11.3	2.6	10.7	1.5	-0.7	0.4	2.7	4.6
1998	7.8	3.5	8.9	9.0	8.3	-0.9	-1.0	-5.1	-1.0	4.6
1999	7.6	2.8	8.5	4.3	9.3	-1.3	-3.2	-2.8	-0.5	1.3
2000	8.4	2.4	9.8	5.7	9.7	2.1	-1.2	1.7	1.0	4.1
2001	8.3	2.8	8.7	6.8	10.2	2.1	2.6	0.1	0.6	4.0
2002	9.1	2.9	10.0	8.8	10.4	0.6	1.7	-1.1	0.2	1.9
2003	10.0	2.5	12.8	12.1	9.5	2.6	2.5	2.7	3.4	2.5
2004	10.1	6.3	11.5	8.1	10.0	6.9	15.5	6.4	7.4	5.0
1992-04	9.9	3.8	12.2	9.1	10.0	5.7	7.2	4.0	6.6	7.0
	(B) Original (CSY) Real Growth Rate (%)					(E) Original (CSY) Implicit Deflator (%)				
1992	14.2	4.7	21.2	21.0	12.4	7.9	4.7	4.9	15.2	12.5
1993	13.5	4.7	20.1	18.0	10.7	14.6	13.3	14.5	36.9	11.9
1994	12.6	4.0	18.9	13.7	9.6	19.9	32.1	15.1	16.0	20.3
1995	10.5	5.0	14.0	12.4	8.4	13.2	20.8	12.0	12.8	10.9
1996	9.6	5.1	12.5	8.5	7.9	5.9	9.8	4.6	9.3	5.5
1997	8.8	3.5	11.3	2.6	9.1	0.8	-0.8	0.1	3.5	3.3
1998	7.8	3.5	8.9	9.0	8.3	-2.4	-1.1	-5.4	-0.2	0.9
1999	7.1	2.8	8.5	4.3	7.7	-2.2	-3.3	-3.1	0.3	-0.3
2000	8.0	2.4	9.8	5.7	8.1	0.9	-1.3	1.4	1.8	2.3
2001	7.5	2.8	8.7	6.8	8.4	1.2	2.5	-0.2	1.4	2.3
2002	8.3	2.9	10.0	8.8	8.7	-0.2	1.6	-1.4	1.0	0.1
2003	9.5	2.5	12.8	12.1	7.8	1.9	2.5	2.4	4.2	0.8
2004	9.5	6.3	11.5	8.1	8.3	6.5	15.4	6.1	8.2	3.0
1992-04	9.4	3.8	12.2	9.1	8.6	4.8	7.2	3.6	7.5	4.9
	(C) Change in Real Growth Rate (%) (= A – B)					(F) Change in Implicit Deflator (%) (= D – E)				
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.5	0.0	0.0	0.0	1.4	1.8	0.1	0.4	-1.1	5.1
1994	0.5	0.0	0.0	0.0	1.4	0.7	0.1	0.4	-0.9	2.0
1995	0.4	0.0	0.0	0.0	1.4	0.6	0.1	0.4	-0.9	1.5
1996	0.4	0.0	0.0	0.0	1.5	0.5	0.1	0.3	-0.9	1.2
1997	0.5	0.0	0.0	0.0	1.6	0.7	0.1	0.3	-0.8	1.3
1998	0.0	0.0	0.0	0.0	0.0	1.5	0.1	0.3	-0.8	3.7
1999	0.5	0.0	0.0	0.0	1.6	0.9	0.1	0.3	-0.8	1.6
2000	0.4	0.0	0.0	0.0	1.6	1.1	0.1	0.3	-0.8	1.8
2001	0.8	0.0	0.0	0.0	1.8	0.9	0.1	0.3	-0.8	1.7
2002	0.8	0.0	0.0	0.0	1.7	0.8	0.1	0.3	-0.8	1.8
2003	0.5	0.0	0.0	0.0	1.7	0.7	0.1	0.3	-0.8	1.7
2004	0.6	0.0	0.0	0.0	1.7	0.4	0.1	0.3	-0.9	1.9
1992-04	0.5	0.0	0.0	0.0	1.5	0.9	0.1	0.3	-0.9	2.1

Sources and Notes: See Table 1.

FIGURE 1: CHINA'S GROWTH PERFORMANCE OF REAL GDP:
REVISED VERSUS ORIGINAL ESTIMATES
(Percent per Annum)
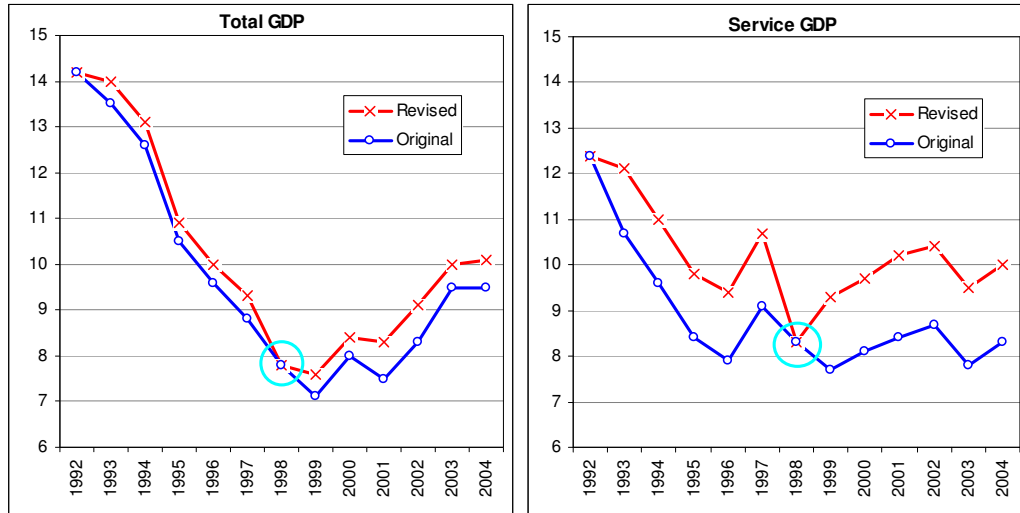
Source: Panels A and B, Table 2.

In this paper we intend to raise some that we consider important questions about NBS's 2004 Census-based GDP revision and explore their likely implications for China's growth performance. Our criticism is ultimately constructive if the official revision of the Chinese national accounts could be made more transparent, convincing and justifiable in future.

Our first inquiry is about the methodology that was used by NBS in the revision. Since the information about the approach used in the revision suggests that NBS followed the standard interpolation procedures in the revision, we will try to duplicate what NBS did to see whether there was any irregularity that could not be derived by the standard procedures.

Our second inquiry focuses on the underlying price problem. This type of census by nature cannot obtain information on price changes. Even if the 1992 benchmark could be assumed problem-free and thus the under-coverage problem is entirely due to new services and products that emerged after 1992, the Chinese statistical authorities still face complicated price problems. Since the prices of new services and products are usually high at earlier stages and decline quickly throughout the stages of maturing, it is apparently very difficult to make plausible assumptions for price changes in the revision. Furthermore, leaving the real GDP growth rate for 1998

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completely unadjusted suggests that the level amendment for this year is a pure price effect, which appears to be rather incoherent in a supposed to be systematic adjustment overtime and hence casts serious doubt on the credibility of the revision. Our question about the underlying price problems can be illustrated by Figure 1. Users of the Chinese GDP estimates would naturally expect an explanation about the assumptions that were used for price changes across individual sectors that could warrant such a revision of the real output.

Last but not least, it is difficult to accept the findings of the 2004 census that the official annual output estimates for manufacturing and mining industries are basically free from problems. How could we fit such findings into numerous disclosures of data fabrications in industrial output made by local officials, SOE managers and even private firms with different incentives? In fact, it has been reported that data fabrication to exaggerate local performance could even be more serious in a national event like census than in the usual reporting exercise that supports the annual estimation. Taking into account these possibilities, in the conclusion we would like to propose some conjectures about the likely real GDP performance over this period.

2. THE BASIC APPROACH USED IN THE NOMINAL GDP REVISION

To the best of our understanding of the brief explanation in the official announcement (NBS, 2006), the basic approach used by NBS in the 2004 Census-based revision of the nominal GDP estimates contains three major steps:

Step 1: Calculating the (simple) deviation of the NBS annual GDP estimates, published in the *China Statistical Yearbook* (hereafter the CSY GDP series), from a "historical trend" that is also derived from the CSY GDP series.

Step 2: Deriving a "new trend" for the same period using the same GDP estimates for 1992 (as in Step 1) and the census-based GDP estimates for 2004, which generates a series of trend-value GDP estimates for this period.

Step 3: Interpolating GDP for individual years between the two benchmarks of the new trend by adjusting the trend-value GDP estimates obtained in Step 2 by the annual deviation value obtained in Step 1 based on the CSY GDP series.

This approach may be best described as one following the trend-deviation interpolation method often used by national accounts statisticians. Based on what is

explained by NBS and the standard procedures of the trend-deviation interpolation method,[2] we have managed to repeat the likely procedures used by NBS in the revision. Our findings show that although NBS in principle adopted the standard interpolation procedures in revising the nominal GDP, they allowed irregularities or arbitrary modifications in the exercise. In what follows, we will firstly present the standard interpolation procedures of the trend-deviation method, secondly derive nominal GDP estimates following the procedures, and finally compare our results with the NBS estimates and discuss their implications.

Strictly speaking, the trend-deviation interpolation method requires an indicator (I) that is highly correlated with the variable (X) to be estimated. The indicator is an existing time series, while the variable to be estimated has only two benchmark values based on surveys or censuses. The indicator is used to obtain the deviation of its actual value from its trend value (i.e. trend-deviation ratio) for every time point of the period concerned. By applying the indicator's trend-deviation ratio to the variable to be estimated, it allows the annual movement pattern of the variable to follow that of the indicator.

Firstly, let us assume that both I and X generally follow an exponential trend, then we could estimate their trend growth rates over a given period n, beginning from the time point 0 to the current time T ($T - 0 = n$), using the following equations for I and X, respectively:

(1a)
$$r_{trend}^{I} = \exp\left[\frac{\ln I_T - \ln I_0}{n}\right] - 1$$

and

(1b)
$$r_{trend}^{X} = \exp\left[\frac{\ln X_T - \ln X_0}{n}\right] - 1 .$$

Secondly, we could use the estimated growth rate of the trend to calculate the trend value at time t over this period for I and X, respectively:

(2a)
$$I_t^{trend} = I_0(1 + r_{trend}^{I})^t$$

and

$$(2b) \qquad X_t^{trend} = X_0(1 + r_{trend}^X)^t.$$

Finally, the *X* series over the period could be estimated by multiplying the trend value of *X* by a parameter *D* based on the indicator *I*:

$$(3) \qquad X_t = D_t^I X_t^{trend}$$

where $D_t^I = I_t^{actual} / I_t^{trend}$, i.e. the deviation of the actual value of the indicator *I* from its own exponential trend.

In the current China case, the indicator is the CSY GDP series rather than any other non-GDP indicator that is closely associated with the variation of GDP. Precisely, the revised GDP series is obtained by adjusting the 1992 and 2004 censuses-based trend values (revised) by the deviations derived from the CSY GDP series (original), that is,

$$(4) \qquad GDP_t^{revised} = D_t^{original} GDP_t^{trend,revised}$$

where $D_t^{original} = GDP_t^{original} / GDP_t^{trend,original}$, the deviation of the actual value from the trend value estimated based on the CSY series. One of the most obvious merits of this interpolation method is to make use of all available information in the existing GDP estimates (the CSY series) and from the newly conducted census.

TABLE 3: CONFRONTATION OF STRAIGHTFORWARD ESTIMATES BY EQ. 4 AND THE NBS REVISED ESTIMATES
(Billion current yuan)

	A) Results of Interpolation by Eq. 4					B) Nominal Gap (= NBS Revised Estimates – Eq. 4 Estimates)				
	Total	I	II (M)	II (C)	III	Total	I	II (M)	II (C)	III
1992	2,664	580	1,028	142	914	0.0	0.0	0.0	0.0	0.0
1993	3,505	689	1,419	227	1,170	28.7	0.0	0.0	-0.1	28.7
1994	4,787	947	1,948	297	1,595	33.0	0.0	0.0	0.0	33.0
1995	6,052	1,202	2,495	373	1,982	27.6	0.0	0.1	0.0	27.5
1996	7,104	1,389	2,945	439	2,332	13.9	0.0	0.0	0.0	13.9
1997	7,898	1,426	3,292	462	2,717	-0.4	0.1	0.0	0.0	-0.5
1998	8,432	1,462	3,402	499	3,070	8.1	0.0	-0.1	0.1	8.1
1999	8,966	1,455	3,586	517	3,408	1.4	0.0	0.0	0.0	1.4
2000	9,923	1,472	4,003	552	3,896	-1.9	0.0	0.1	0.0	-2.0
2001	10,967	1,552	4,358	593	4,465	-2.0	-0.1	0.0	0.1	-1.9
2002	12,035	1,624	4,743	647	5,021	-1.6	0.1	0.0	0.0	-1.7
2003	13,589	1,707	5,495	749	5,638	-6.3	0.0	0.0	0.1	-6.3
2004	15,988	2,096	6,521	869	6,502	0.0	0.0	0.0	0.0	0.0

Sources: Author's calculation using Equation 4. NBS revised nominal GDP data are from Panel A, Table 1.

We have produced a new set of estimates using Equation 4 and reported it in Panel A of Table 3. In Panel B, we have calculated the nominal value gap between our results and the NBS revised estimates to see if the standard interpolation procedures of the trend-deviation interpolation method were followed by NBS. If the standard procedures were strictly followed and no *ad hoc* adjustments were imposed on the results, the expected value of the "nominal gap" should be zero. As shown in Table 3, it appears that on the one hand, NBS indeed adopted the standard procedures of the trend-deviation interpolation method because by following the standard procedures straightforwardly we could produce identical results to those given by NBS for all the non-service sectors but, on the other hand, our results show that NBS introduced some *ad hoc* modifications to the results for services obtained by the standard procedures.

FIGURE 2: HOW MUCH HAS BEEN ADJUSTED AND HOW CLOSE TO THE STANDARD
PROCEDURES?
(Nominal GDP indices)
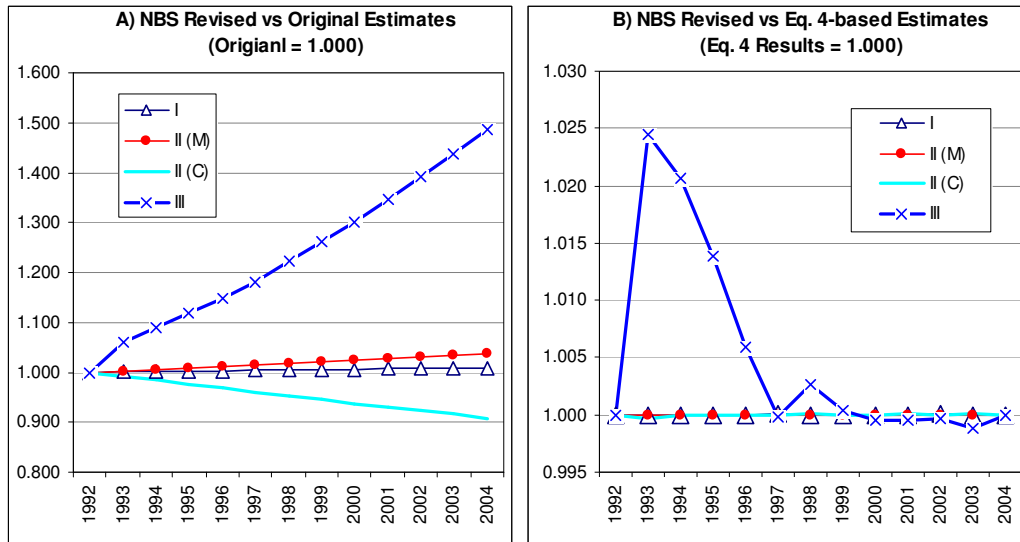
Source: Indices in Panel A above are calculated using the data in Panels A and B of Table 1. Indices in Panel B above are calculated using the data in Panel A of Table 1 and the data in Panel A of Table 3.

To intuitively demonstrate this point, in Figure 2 we compare the NBS revised nominal GDP level with both the original CSY estimates and our Equation 4-based results. The sector and industry codes are defined as those in Table 1, namely primary (I), secondary (II) and tertiary (III), with the secondary sector further divided into two subgroups, one including manufacturing, mining and utilities and one including

construction (II (M) and II (C), respectively). In Panel A, in order to highlight the effect of the NBS revised GDP estimates (see Panel A, Table 1) *relative* to the original CSY estimates, the original estimates (Panel B, Table 1) are set as the base value (=1). One could see clearly that all sectors are affected by the revision, with the tertiary sector affected most and positively, followed by the construction industry, but negatively.

To see whether the revision exactly followed the standard procedures of the trend-deviation interpolation method, in Panel B we set the Equation 4-based estimates as the base value (=1). The logic is that if the NBS revision strictly followed the standard procedures, its results would have completely overlapped with our results, i.e. the ratio for all sectors would have been equal to one at all time points. While this is basically true for the non-service sectors, it is not the case for the tertiary sector. One could see that the NBS revised estimates for the tertiary sector drift from the baseline at most time points with a rather irregular pattern, which confirms that NBS did introduce *ad hoc* adjustments to the results that could be obtained through standard procedures.

It is difficult to understand why such irregularities or arbitrary adjustments were introduced into the nominal GDP revision. In fact, as we have discovered below, any *ad hoc* amendment to the nominal GDP estimates obtained by the standard procedures became unnecessary because NBS (rather unexpectedly) bypassed the price problem in the revision of the real GDP growth estimates. Another question related to Panel B, that is, if the 1992 benchmark were indeed problem-free as assumed by NBS in this revision, why should the nominal service GDP in 1993 as obtained through the standard procedures be substantially lifted?
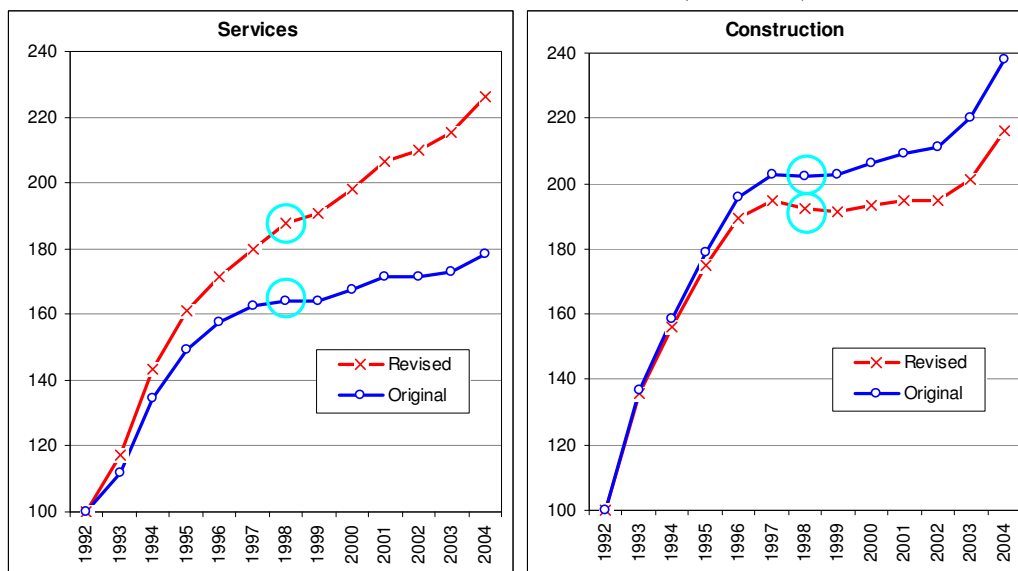
3. THE REVISION OF THE REAL GDP GROWTH RATE ESTIMATES

To obtain the estimates for the real GDP growth rates, one needs proper deflators. However, China's first economic census in 2004 did not include any survey on prices (which is not a usual task in this type of census). All output and income data collected in the census are stock information at the time of census and only in nominal terms. Therefore, in the current context, the price issue is basically independent. Then, what assumptions were applied to the price changes of individual sectors that could warrant the revision of the real GDP estimates as shown in Figure 1?

Changes in implicit deflators

Let our investigation start with the implicit GDP deflators of individual sectors reported in Panels D and E, Table 2. Both the original and revised estimates-derived implicit deflators can be converted into 1992-based indices to demonstrate impact of the revision on price change over time. The results for services and construction are shown in Figure 3. We choose the two sectors because they were most affected in the revision especially in nominal terms and hence in price deflators. Besides, the revision has resulted in opposite effect on the two sectors. Intuitively, the revised deflator appears to be fairly "systematic". Compared with the original price index, the revision has resulted in higher price levels for services and lower price levels for construction over the whole period in question. In general, the underlying trend has changed substantially in both cases, but the annual pattern of the movement remains similar. However, a closer examination shows that in each case the revision of the price index for 1998 created an obvious "outlier" that was not in line with the original annual pattern and largely responsible for the slope change of the trend.

FIGURE 3: IMPLICIT GDP DEFLATORS FOR THE SERVICE AND CONSTRUCTION SECTORS: REVISED VERSUS ORIGINAL ESTIMATES (1992=100)

Sources: Author's calculation based on data from Panels D and E, Table 2.

This observation, together with Figure 1 that shows no any revision to the real GDP growth rate in 1998, has taken us back to the hot debate in the early 2000s about the likelihood of the statistical authorities' serious data manipulation that arbitrarily

raised the growth rate for 1998 in order to meet then the government (Zhu Rongji Administration)'s growth target when China was badly hit by the Asian financial crisis. The official estimate of the real GDP growth rate for 1998 was 7.8 percent, only 0.2 points lower than the 8-percent growth target for that yeat, suggesting that the target was only missed by a minuscule margin in a very difficult economic situation. However, this growth rate has been challenged by many researchers. They believe that it overestimated China's real growth performance in 1998. For example, based on the change of energy consumption for 1997-99, Rawski (2001) suspected that China's real GDP growth in 1998 was at best ranging from -2 to 2 percent. But his estimation was criticized by Ren (2002) among others for lacking sound empirical support. Other researchers used the expenditure approach (in contrast to the NBS's value-added approach), but arrived at very different results. Keidel (2001) found that the growth rate in 1998 could be bounded by 6.9 and 7.2 percent, while Shiau's recent results showed that it could be somewhere between 2.6 and 4.7 percent (2005). Such variations in estimates are largely due to different choices of deflators.[3] Without a proper justification on the choice of deflators, the census-based revision was surely in no position to face these challenges.

Unfortunately, the infamous "7.8 percent" for 1998 is a big obstacle that NBS could not easily bypass when revising China's real GDP growth rate. Apparently NBS faced a big dilemma. On the one hand, it could not systematically raise the growth rate of 1998 together with the overall upward revision for the whole period because that would invite further international criticism. On the other hand, it could not take this chance to reasonably make a downward revision for 1998 because that would mean that they had admitted the original estimates as a serious mistake, whose implications would be by no means purely technical to the authorities. Although leaving 1998 intact in this overall upward revision means that the growth rate of 1998 is in fact *relatively* lowered, such an arbitrary treatment has made the whole revision less credible.

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[3] It should be mentioned that there are also different views. Using the principal component analysis, Klein and Ozmucur (2002) find that the variation of the official GDP growth is well associated with the variation of 15 major macroeconomic indicators, suggesting that the official GDP estimates are not an outlier. Nevertheless, since the major indicators are from the same official sources that generate the information for the GDP estimation, surely no sensible inference can be made from their findings in the context of the debate.

The treatment to 1998 suggests that there were certainly *ad hoc* modifications in the revision, but one cannot be sure whether they were made on prices or real growth rates. Nevertheless, by assuming that the 1992 benchmark was problem-free, NBS faced more complicated price problems. This assumption simply means that the undercoverage problem is mainly due to the new products or services that only emerged after 1992. Since the growth of new products/services is very price-sensitive, their prices are usually high at the early stages and decline quickly throughout the stages of maturing. It is therefore almost impossible for NBS to introduce a new trend to adjust the original price changes in the absence of necessary price information for new products or services. Then, how did NBS solve the price problem in the revision? Our working hypothesis is that NBS did not *directly* work on prices; instead it began with a new GDP growth trend that could satisfy a certain growth target for the period in question and then followed the trend-deviation interpolation method to adjust the original annual real growth rates. In other words, the new (revised) deflators as shown in Figure 3 are merely *indirect* results of the revised real growth rate estimates rather than actual price changes that are independent of the revision.

The government growth target

Our questions are: What is the government growth target? How could that target affect NBS's revision of the real growth estimates? Back to the central planning era, the "state of art" of the planning administration in China was "leaving room (*liu you yu di*)" for fulfilling annual or five-year plans (FYPs). Since undershooting the planned target were politically unacceptable, economic authorities at all levels tended to leave enough "room" so that they could easily meet or even exceed their targets. As Table 4 shows, there was virtually no target undershooting in any of the FYPs since the 1980s.[4] However, it shows that the extent to which the target was exceeded varied greatly. This is largely a consequence of a game between lower and upper planning authorities. A great excess of the planned target (as seen in the 6th and 8th FYPs, Table 4) often sends a signal to the upper authorities indicating that lower authorities might have deliberately left too much "room" in the current plan. Thus, in the next FYP the central authorities tend to set a higher growth target to maximally tap the potentials. Yet, this may leave little room for overfulfilling the plan. In such a case the plan may be just met or marginally overshot (as seen in the 7th and 9th FYPs). One could also

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[4] This is also the case during the pre-reform period, but it is beyond the scope of this study.

interpret this result as a warning from the lower authorities that if such a high target is to be maintained, there may be a good chance to miss it. That is why we could see a marginal excess of the target often to be followed by a downward adjustment of the planned target in the next FYP (as seen in the 8th and 10th FYPs).

TABLE 4: GROWTH TARGET AND ACTUAL GROWTH ACHIEVED OF
CHINA'S FIVE-YEAR PLANS (FYPS)
(In percent)

Five Year Plan (period covered)	Growth target	Target adjusted compared with the last FYP[a]	Growth rate achieved	Growth rate achieved (revised)[c]	Growth target overshot or undershot[b]	Growth target overshot or undershot[b] (revised)[c]
The 6th Five-Year Plan (1981-1985)	4.0	n.a.	10.7	n.a.	167.5	n.a.
The 7th Five-Year Plan (1986-1990)	7.5	87.5	7.9	n.a.	5.3	n.a.
The 8th Five-Year Plan (1991-1995)	6.0	-20.0	12.0	12.3	100.0	105.0
The 9th Five-Year Plan (1996-2000)	8.0	33.3	8.3	8.6	3.8	7.5
The 10th Five-Year Plan (2001-2005)	7.0	-12.5	8.8	9.4	25.7	34.3
The 11th Five-Year Plan (2006-2010)	7.5	7.1	n.a.	n.a.	n.a.	n.a.

Sources: Information on the growth target of various five-year plans is available from ECACE (various annual volumes) and the website of NDRC (National Development and Reform Commission) (http://ghs.ndrc.gov.cn/). The GDP growth rate for 2005 is 9.9% (as reported by the New China News Agent, March 6, 2006), which is used for calculating the average growth rate of the 10th FYP.

*Note*s: a) Calculated as (current target rate/previous target rate – 1)*100.
  b) Calculated as (actual rate/target rate – 1)*100.
  c) Calculated using the recent 2004 Census-based revision of growth rates.

In such a process, changes in national plans can be rather erratic and hence the macroeconomic performance tends to be volatile. For the current discussion, it is important to note that the situation began to change in the early 1990s when the market was allowed to play more important roles in economic decisions. Around the mid-1990s, the authorities began to exercise monetary and fiscal policies to replace the traditional planning administration, aiming to smooth out aggregate volatility. The highly volatile or stop-go macroeconomic performance under the Zhao Ziyang's and Li Peng's administration from the mid 1980s to the mid 1990s has taught the later governments some important lessens: the growth should not be too fast to maintain necessary macroeconomic balances, especially energy, minerals and transportation, but it should be fast enough to create jobs and hence reduce the pain of the reform of the state sector.

Yet, how fast is just fast enough? The leadership's "rule of thumb" is close to but not more than 10 percent a year. This has been seen in discussions of various central

governments' think tanks. For example, Liu (1999) described an "ideal policy goal" as "high growth that could achieve 9 or below 10 percent a year and low inflation that should be not more than 3 percent a year". This growth target should be, nonetheless, taken as the actual performance taking into accounts both the target/planned rate and the room for overshooting. In fact, from Table 4, although what we have observed in the game of planning is still in place: a lower target that gives enough room to overshoot, the process has become a lot smoother recently (comparing the achieved growth rates over the 9th and 10th FYPs with those over the 6th to 8th FYPs in Table 4).

Given this "rule of thumb", the growth that had already been achieved in the period in question and the macroeconomic policy target at more stable growth, there was really not much room for NBS to play in the revision. On the one hand, NBS had to justify its emphasis on services in the census to support its strong belief that the service GDP had been indeed underestimated, which must have some positive bearing on the overall growth; on the other hand, it might be politically difficult to downward adjust the real growth rate of any other sectors. NBS might have tried several scenarios in the revision, but it looks that an annual growth rate of 9.9 percent was the most acceptable rate for the period 1992-2004.[5] Since the impact of this upward revision on the entire reform (post-1978) period is merely 0.2 points (up from 9.4 to 9.6 as announced when NBS released their revised growth estimates), this result may not significantly aggravate international critics who have believed that China's post-reform GDP growth performance has already been exaggerated (e.g. Maddison, 1998 and 2006). Nevertheless, it indeed presents a much better FYP performance for the current administration, that is, the revised real GDP growth rate for the 10th FYP period (2001-05) is 9.4 rather than 8.8 percent per annum (Table 4)!

What if the original deflators were adopted?

To support our growth target hypothesis, firstly, we have to see what would be the effect on China's GDP growth rate if NBS just used the original GDP deflators (Panel E, Table 2), which is certainly the most logical choice for NBS. Or by how much it would undershoot or overshoot the official target if NBS did so? Our results show that other things being equal, if the original NBS price deflators were used, the annual growth rate of China's GDP in 1992-2004 would be 10.8 per annum, further raised by

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[5] The rate has been rounded up. More precisely it should be 9.87% if we use two decimal points.

0.9 percent from the revised rate of 9.9 percent. This means that if the "rule of thumb" target rate was indeed 10 percent or slightly below it, using the original deflator would certainly overshoot the target.

FIGURE 4: WHAT IF THE ORIGINAL DEFLATORS WERE ADOPTED?
(Percent per annum)
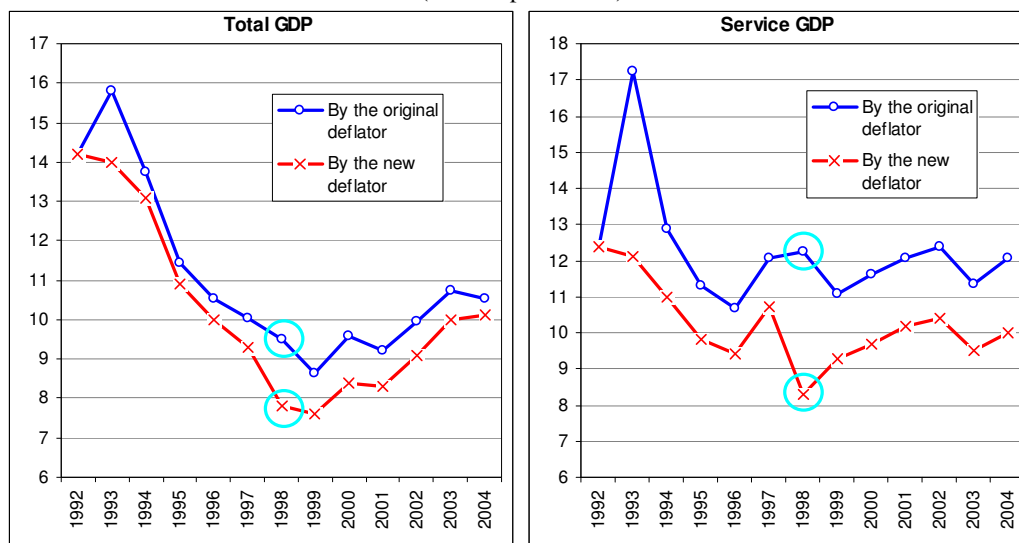
Source: Nominal GDP are deflated by the implicit deflators. Data for nominal GDP are from Panels A and B of Table 1. Data for deflators are from Panels D and E of Table 2.

Figure 4 shows the effect of the original and the "new deflators" upon the real growth. The NBS newly revised estimates for the total and service GDP in nominal terms are deflated by the two deflators, respectively.[6] The results on annual changes show that if the original price deflators were used, firstly, the already over-heated economy in 1993 as suggested by the original data would be much worse (more out-of-control growth) than what was then admitted by the authorities. Secondly, the Li Peng Administration highly claimed "soft landing" in 1996 would become less "soft": dropping from the peak of 15.8 percent in 1993 (the time when Zhu Rongji, then the Vice Premier, began to clean up the mess of the central bank for irresponsible credit expansion) to 10.5 percent in 1996 rather than from 14.0 to 10.0 percent as suggested by the original estimates. Thirdly, the widely criticized overstatement for the performance in 1998 when China was badly hit during the Asian financial crisis would look even more exaggerated (9.5% instead of 7.8%). All these are politically

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[6] Note that the series deflated by the new deflators are the same as those shown in Figure 1 (i.e. the one labeled with "revised" in Figure 1), while the series deflated by the original deflators are from our calculation.

difficult to accept. Therefore, it is reasonable to believe that in the absence of "satisfactory" deflators, it is quite inevitable for NBS to directly work on the revision of the real growth estimates with some pre-set growth rates that could ensure the government's "rule-of-thumb" growth target to be met.

Revising real growth estimates by interpolation

To investigate the actual procedures adopted by NBS to work out the real GDP growth we begin with the new "trend rate" of 9.9 percent (see Equation 1b) for the whole economy in 1992-2004. Then, we use this growth rate to generate a series of "trend values" as a 1992-based index (based on Equation 2b). Next, we adjust this index by a set of deviation parameters (*D*, in Equation 4, equivalent to Equation 3) obtained from the original real output index also with 1992 as the benchmark. The same exercise is done for every sector. However, we follow NBS to assume that there is only pure price effect on the output of the non-service sectors, i.e. no adjustment to the CSY estimates for 1992 and 2004 (see Panel C, Table 2).

TABLE 5: CONFRONTATION OF REAL GDP GROWTH INDICES BASED ON EQUATION 4 AND THOSE CONSTRUCTED BY NBS REVISED ESTIMATES
(1992=100)

| | A) Equation 4-derived Growth Index | | | | | B) Growth Index Ratio (NBS Index = 1.000) | | | | |
	Total	I	II (M)	II (C)	III	Total	I	II (M)	II (C)	III
1992	100.0	100.0	100.0	100.0	100.0	1.000	1.000	1.000	1.000	1.000
1993	114.0	104.7	120.1	118.0	112.2	1.000	1.000	1.000	1.000	1.001
1994	129.0	108.9	142.8	134.2	124.6	1.000	1.000	1.000	1.000	1.001
1995	143.1	114.3	162.8	150.8	136.9	1.001	1.000	1.000	1.000	1.002
1996	157.6	120.2	183.1	163.6	149.6	1.002	1.000	1.000	1.000	1.001
1997	172.2	124.4	203.8	167.9	165.4	1.002	1.000	1.000	1.000	1.000
1998	186.5	128.7	222.0	183.0	181.6	1.006	1.000	1.000	1.000	1.013
1999	200.6	132.3	240.8	190.9	198.1	1.006	1.000	1.000	1.000	1.012
2000	217.6	135.5	264.4	201.7	217.1	1.007	1.000	1.000	1.000	1.010
2001	235.0	139.3	287.5	215.4	238.4	1.004	1.000	1.000	1.000	1.007
2002	255.7	143.3	316.2	234.4	262.6	1.001	1.000	1.000	1.000	1.005
2003	281.2	146.9	356.7	262.8	286.9	1.001	1.000	1.000	1.000	1.002
2004	309.3	156.2	397.7	284.1	314.9	1.000	1.000	1.000	1.000	1.000

Sources: Author's calculation for Panel A.

Panel A of Table 5 reports our results by the standard procedures. In Panel B, our results are compared with those of NBS with the latter as the base (=1). As expected, the comparison confirms that firstly, for all non-service sectors our results have exactly replicated what reported by NBS, supporting our hypothesis that NBS has bypassed the price problem and directly work on the revision of the real growth rates.

Secondly, for services there again observed some *ad hoc* downward modifications (as the discrepancies are all positive – Panel B) made to the results obtained through the standard procedures. Logically, such modifications effects create what we call "real value gaps" that should be compensated by opposite price effect.

Next, in Table 6 using our estimates of both the nominal GDP (Table 3) and the real growth rates (Table 5), we work out the implicit GDP deflator for individual sectors, then compare it with the implicit deflators derived from the NBS revised estimates (Panel D, Table 2) with the latter as the benchmark (=1). If the ratio differs from one, it indicates some "price effect" created by *ad hoc* modifications to the estimates that could be obtained through the standard interpolation procedures as given by Equation 4. We shall call such effect in this context as "price gap". In the current case, such "price gap" should be less than one as we expected. Our results indeed show that it is the case for the tertiary sector. We depict both "real gaps" and "price gaps" in Figure 4. If without "nominal gap", one would expect to see the two gaps mirroring to each other. Apparently, this is not the case, which certainly deserves further investigation.

TABLE 6: CONFRONTATION OF IMPLICIT DEFLATORS BASED ON EQUATION 4 RESULTS AND THOSE BY NBS REVISED ESTIMATES

	A) Implicit GDP Deflator					B) Deflator Ratio (NBS Index = 1.000)*				
	Total	I	II (M)	II (C)	III	Total	I	II (M)	II (C)	III
1992	100.0	100.0	100.0	100.0	100.0	1.000	1.000	1.000	1.000	1.000
1993	115.4	113.4	114.9	135.8	114.2	0.992	1.000	1.000	1.000	0.975
1994	139.4	150.0	132.6	156.2	140.1	0.993	1.000	1.000	1.000	0.978
1995	158.7	181.3	149.0	174.8	158.5	0.994	1.000	1.000	1.000	0.985
1996	169.2	199.2	156.3	189.5	170.5	0.996	1.000	1.000	1.000	0.993
1997	172.2	197.7	157.0	194.6	179.7	0.998	1.000	1.000	1.000	1.000
1998	169.7	195.8	149.0	192.5	185.0	0.993	1.000	1.000	1.000	0.984
1999	167.8	189.6	144.8	191.5	188.2	0.994	1.000	1.000	1.000	0.988
2000	171.2	187.2	147.2	193.5	196.4	0.993	1.000	1.000	1.000	0.990
2001	175.2	192.1	147.4	194.6	204.9	0.996	1.000	1.000	1.000	0.993
2002	176.7	195.3	145.9	194.9	209.2	0.999	1.000	1.000	1.000	0.996
2003	181.4	200.3	149.8	201.5	215.0	0.999	1.000	1.000	1.000	0.999
2004	194.0	231.3	159.4	216.3	226.0	1.000	1.000	1.000	1.000	1.000

Sources: Author's calculation based on Table 5 for Panel A. NBS revised estimates are from Tables 1 and 2.

Taking 1993 as an example, the real GDP ratio is 0.1 percent above the benchmark (= (1.001 – 1)*100), but the (implicit) deflator ratio is 2.5 percent below the benchmark (= (0.975 – 1)*100). How could this be explained? In fact, what are missing here are NBS's *ad hoc* modifications to the nominal values that we have

discovered earlier (see Table 3). By adding the "nominal gap" that could be derived from Table 3, also taking NBS figures as the base (=1), the "real gap" in Figure 4 can now be explained. This could be double checked by using the implicit deflator to calculate a new set of the "real gap", which we found is exactly the same as the one obtained by directly comparing our results (standard procedures) with the NBS results.

FIGURE 5: HOW MUCH HAS BEEN ARBITRARILY ADJUSTED AS SUGGESTED BY THE STANDARD INTERPOLATION PROCEDURES?
– "Gaps" compared with the NBS nominal, real and implicit price estimates
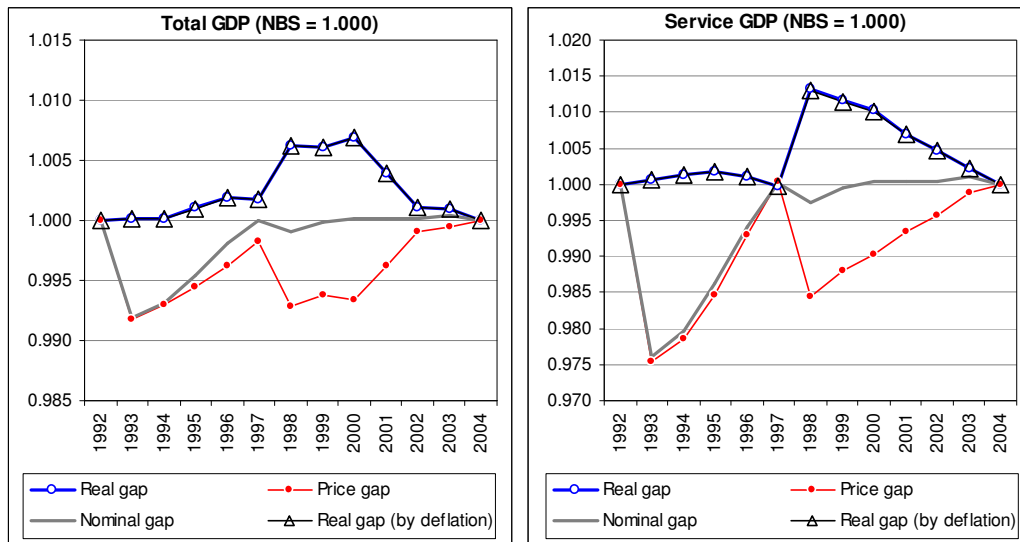
Source: Derived based on data from Tables 3, 5 and 6.

In fact, Figure 5 demonstrates what arbitrary modifications in nominal or real (hence implicitly in price) that NBS had to make in order to arrive at their desired growth rate estimates.

4. WHAT IF ANY OF THE TWO BENCHMARKS IS UNRELIABLE?

So far we have not challenged any of the two benchmarks based on the 1992 and 2004 census results that were used by NBS in the revision. Apparently, the revision based on the deviation of the old trend from the new one is acceptable only if the new trend is accurate. NBS's revision improperly assumes that the estimates based on the 1992 tertiary census are accurate, which is opposite to the belief of many NBS statisticians that some services were not sufficiently covered both in the 1992 census and afterwards. One may argue that in an extreme case, if the degree of the undercoverage or underreporting was more or less the same back in 1992, there is no justifiable reason for revising the existing real growth rate estimates. However, as many may

argue, with continuous efforts made by NBS over the past decade to improve its statistical work including statistical coverage, the undercoverage problem might have been improved overtime, therefore the growth rate should be adjusted downward rather than upward. In reality, it is quite likely that there is a combined effect of the two forces.

Our next question is whether the 2004 Census results are reliable. There are a number of important problems observed in the annual estimates based on the NBS statistical reporting system were not fully addressed in the conduction of the census, which further substantiate our skepticism. The first problem is the serious discrepancy between local and national accounts. China's regional GDP estimates have been persistently higher than national estimates, which is largely driven by the political incentives of localities. As disclosed by Li Deshui, the former Head of NBS, at the 2005 CPPCC (China People's Political Consultation Congress) in Beijing, if regional estimates were used instead, China's GDP in 2004 would be 2658 billion more and its growth rate would be 3.9 percentage points higher than the NBS figures estimated based on the information through the state statistical reporting system (reported by a Chinese newspaper *Southern City Herald*, March 8, 2005). Ironically, this 2658 billion yuan of likely data inflation is coincidently close to the 2300 billion of underestimation discovered by the 2004 census.

Li's point was made just after the 2004 census or at the early stage of the work on the census data including crosschecking, but why eventually there is no any information on how serious the over-reporting problem by localities as discovered in this census. As the serious discrepancy between regional and national GDP accounts has been hanging there for over a decade, it is very reasonable to assume that NBS would have taken this census as a very good opportunity to investigate the likely causes of the discrepancy. Nevertheless, the revised estimates by NBS appear to confirm that the only possible problem of China's GDP estimation has been the underestimation of service output.

Further more, it is difficult to accept that other sectors are problem-free. The state statistical reporting system has been widely criticized for misreporting not only for services but also for manufacturing industries and one of the main purposes of the national economic census in 2004 is to compensate for the deficiencies of that system. According to Xu (2002), NBS has to downward adjust rural industrial output since the

1990s after they discovered in the 1995 industrial census that 40 percent of the rural industrial output was overstated. In fact, some very serious data fabrication cases were found even during the 2004 Census,[7] suggesting that over-reporting of manufacturing output at or below township level could be a big problem. One would reasonably question why the census did not discover any significant output overestimation in manufacturing industries.

FIGURE 6: OFFICIAL ESTIMATES MAY HAVE EXAGGERATED CHINA'S INDUSTRIAL GROWTH AND SMOOTHED OUT INDUSTRIAL VOLATILITY, 1978-2002
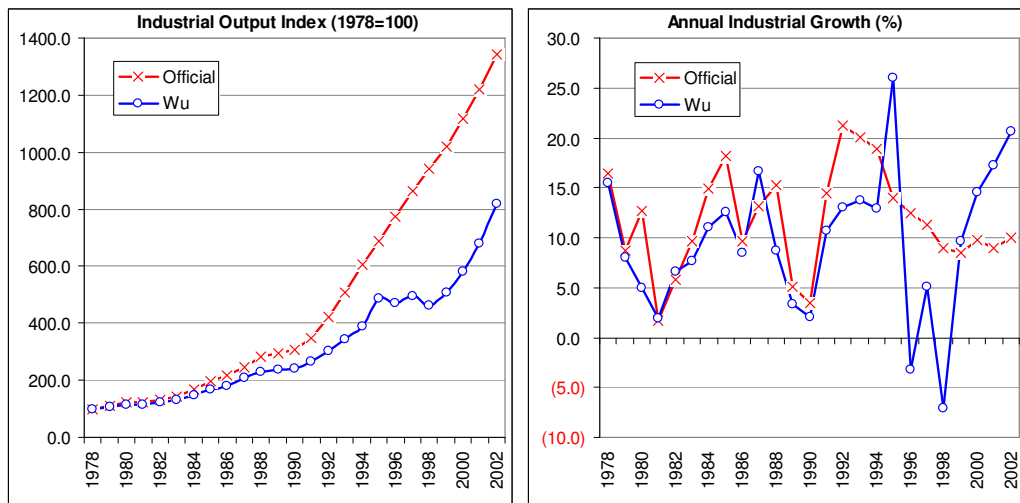
Source: Author's preliminary estimates that update his results published in *Review of Income and Wealth*, 48:2 (2002). Refer to that paper for the methodology used in the estimation.

In an earlier study (Wu, 2002), based on major industrial products with fixed 1987 weights derived from China's 1987 Input-Output Table, I constructed a real output index for Chinese industry, which could bypass the "comparable price" problem (i.e. the segmented weights problem as commented by Maddison, 1998). My estimates significantly challenge the official estimates by showing that the latter might overstate the industrial growth for the period 1978-97 by 3.3 percentage points. Figure 6 reports a preliminary update of my earlier estimates for the period 1978-2002. Over this period my estimates show that China's industrial growth was 16.2 percent per annum compared with the official figure of 20.4 percent per annum.

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[7] For example, one of the serious data fabrication cases disclosed is that the authorities of Maiwang Town, Hubei Province, assigned village officials with "income quotas" which were supposed to be filled into the census questionnaires. As a result, 80 million yuan business income by private firms was blown up to 1009 million, or 12.6 times the actual value that was discovered by a NBS taskforce after an anonymous informant reported to the census authorities (*Southern Weekly*, 2 June, 2005). One may reasonably wonder if this case is only the tip of iceberg.

In addition, my estimates also suggest negative industrial growth in 1996 (-3.2 percent, at the time when the authorities claimed a "soft landing") and 1998 (-7.1 percent), which is in line with overall macroeconomic performance in China and the situation in the world economy, especially in the Asian financial crisis. In addition, the figure demonstrates that the official series of annual growth since the early 1990s is significantly less volatile than my series, suggesting that the actual volatility in industrial production might have been smoothed out to show more stable growth.

5. CONCLUDING REMARKS

The census is unquestionably one of the Chinese statistical authorities' serious efforts to improve the quality of China's national accounts. Yet, the legacies of the traditional system and political constraints have limited its effect. In this study we have played a detective role in an attempt to find out the approach adopted by NBS in its revision of China's GDP growth estimates based on the 2004 Census. Our purpose is after all constructive in that questions raised through our investigation may help make the revision procedures more transparent, convincing, justifiable and methodologically sounder.

There are still a lot of problems ahead before we could arrive at more solid conclusion about the real growth performance of the Chinese economy. In this final remark, we could only touch the always tempting question, "How fast has the Chinese economy grown?" by quoting Angus Maddison (2006)'s recent update of his estimate for China's GDP growth. Maddison incorporates his work on agriculture and services with my work on industrial output, including the above cited preliminary update to my earlier estimates of China's industrial growth.

By converting the nominal values into the 1990 international Geary-Khamis dollars, Maddison shows that China grew at 7.9 percent per annum in the period 1990-2003 (a period largely overlapping with the period in the current study) that could be compared with the official rate of 9.9 percent per annum. He has not taken into account NBS's recent upward revision by 0.5 percent. If we can accept the NBS revised estimates, Maddison's estimate should be raised to 8.4 percent per annum. Although this is still 1.5 percentage points below the official growth rate, it is a rate that could quadruple the Chinese economy in less than 18 years, which easily overshoots Deng Xiaoping's and his successors' growth targets.

However, one should bear in mind that given the current measure of input growth, if the growth rate estimated by Maddison is closer to the reality than the official estimates, it will seriously challenge any existing growth accounting results on the productivity of the Chinese economy based on the official growth rate estimates.

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