
The Chinese GDP Growth Rate Puzzle: How Fast Has the Chinese Economy Grown?*

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Abstract

The Chinese statistical authorities 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, the methodology used in their 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, we have found that the estimates that could be obtained by the straightforward interpolation procedures were significantly modified. Based on a 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.

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

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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, 2002; Maddison 1998; Ren 1997; Woo 1998; Keidel 1992). These data problems are not only seen in the official annual estimates¹ but also in surveys and censuses. Without a doubt, allocating more public resources to conduct surveys or censuses may improve statistical coverage, hence increasing the accuracy of statistics, but it alone will not be the solution to the data problem. On 31 December 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 2 billion yuan (*People's Daily* online, 22 December 2005). Although 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 20 December 2005, after about one year's work on the census data, China's NBS announced that the census-based GDP estimate for 2004 was RMB 15,988 billion. This raises the nominal GDP level in 2004 by RMB 2,300 billion, or 16.8 percent, compared with the original estimates based on the annual statistics (13,688 billion) available in the *China Statistical Yearbook* (CSY) (see 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 2002), and 10.4 percent to industry (the Chinese standard of industry includes mining, manufacturing, and utilities, i.e., II (M) in Table 1), which seems surprisingly small given the problems found in the Chinese industrial statistics (see Wu 2002). There is also a 0.8 percent upward revision that is attributed to agriculture, which does not 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 percent + 10.4 percent + 0.8 percent = 103.8 percent), or 88 billion yuan, that has to be "made up" by an unexplained downward adjustment for construction output (see panel E, II (C), Table 1).

On 9 January 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

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 by various ministries) that was developed during the central planning period.

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
1992–2004						14.6	11.2	16.3	17.3	13.9
	(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
1992–2004						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
1992–2004						1.5	0.1	0.4	-0.9	3.8

Source: The revised estimates are published at the NBS website (www.stats.gov.cn/tjdt/zygg/t20060109_402300176.htm) following the official announcement on 9 January 2006. The former or CSY annual estimates are available from China Statistical Yearbook (NBS 2005 and earlier issues).

Notes: 1992 is used as the initial benchmark that is not included in the revision.

I = primary; II = secondary that includes II (M) (manufacturing, mining, utilities) and II (C) (construction); III = tertiary.

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.

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 the nominal GDP growth rate from 13.9 to 17.8 percent 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)), the revision 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.

In this paper, we raise some questions about NBS's 2004 census-based GDP revision and explore their likely implications for China's growth performance. Our objective is to be constructive to the process of improving the accuracy of the Chinese national accounts by examining methodological issues.

Our first methodological inquiry is to identify the procedures that were used by NBS in the revision. Because 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 are any departures from the standard procedures.

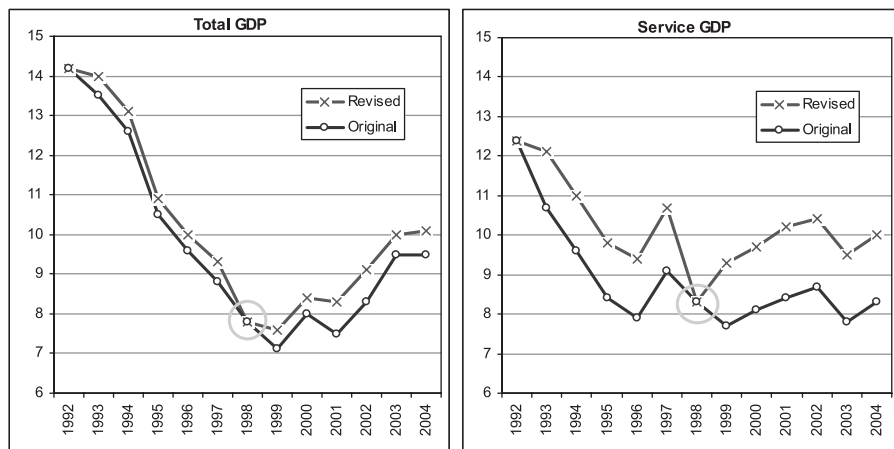
Our second methodological inquiry focuses on the underlying price problem. This type of census by nature cannot obtain information on price changes. Even if the 1992 benchmark could be assumed problem-free and thus the under-coverage

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
1992–2004	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
1992–2004	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
1992–2004	0.5	0.0	0.0	0.0	1.5	0.9	0.1	0.3	-0.9	2.1

Source and Notes: See Table 1.

Figure 1. China's growth performance of real GDP: Revised versus original estimates (percent per annum)



Source: Table 2, panels (A) and (B).

problem is entirely due to new services and products that emerged after 1992, the Chinese statistical authorities still face complicated price problems. Because the prices of new services and products are usually high at earlier stages and decline quickly throughout the stages of maturing, it is apparently difficult to make plausible assumptions for price changes in the revision. Furthermore, leaving the real GDP growth rate for 1998 completely unadjusted suggests that the level amendment for this year is a pure price effect, which appears to be inconsistent with the systematic adjustment of data over the entire period. 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.

Finally, 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 reconcile such findings with 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 be even more serious in a national event like a census than in the usual reporting exercise that supports the annual estimation. Taking into account these possibilities, we would like to propose in the conclusion 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 the trend-deviation interpolation method often used by national account 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 discretionary modifications in the exercise. In what follows, we will first present the standard interpolation procedures of the trend-deviation method, then 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 considered highly correlated with the variable (X) to be estimated. The indicator is an existing time series, and 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.

² See an introduction to the procedures by Derek Blades (2004), the former chief of national accounts at OECD, prepared for the NBS/Asian Development Bank Workshop of “Improving Service Statistics in China” in Shanghai in November 2004.

First, 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:

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

and

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

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:

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

and

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

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 :

$$X_t = D_t^I X_t^{trend}, \tag{3}$$

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 case of China, 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,

$$GDP_t^{revised} = D_t^{original} GDP_t^{trend, revised}, \tag{4}$$

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. Comparison of straightforward estimates by equation (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

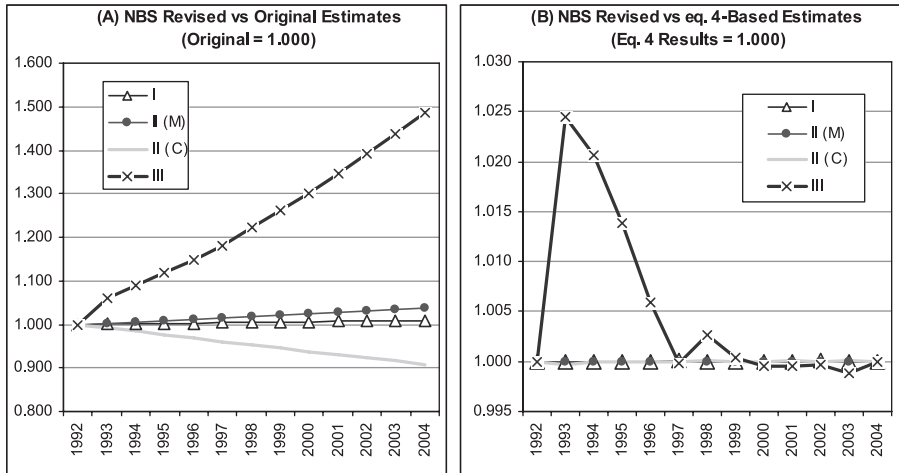
Source: Author's calculation using equation (4). NBS revised nominal GDP data are from Table 1, panel (A).

We have produced new estimates for every component of GDP using equation (4) and reported them 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, the expected value of the “nominal gap” should be zero. Table 3 shows that NBS did indeed adopt the standard procedures of the trend-deviation interpolation method for all the non-service sectors, but introduced some unexplained modifications to the results for services obtained by the standard procedures.

Figure 2 compares 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). The secondary sector is further divided into two subgroups: manufacturing, mining, and utilities, II (M); and construction, II (C). Setting the levels in 1992 to be 1, panel (A) in Figure 2 shows that all sectors are affected by the revision, with the tertiary sector affected most and positively, followed by the construction industry, but negatively.

Panel (B) of Figure 2 shows whether the revision exactly followed the standard procedures of the trend-deviation interpolation method. If the NBS revision had strictly followed the standard procedures, its results would have completely overlapped with our results, that is, the ratio for all sectors would have been equal to one at all time points. Although this is basically true for the non-service sectors, it is not the case for the tertiary sector. One can see that the NBS revised estimates for the ter-

Figure 2. How much has been adjusted and how close to the standard procedures? (nominal GDP indices)



Source: Indices in panel (A) 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.

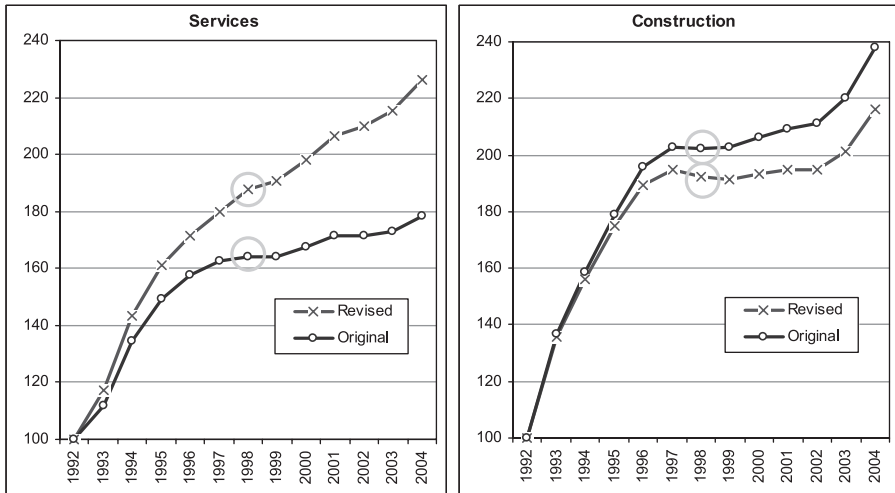
tiary sector drift from the baseline at most time points with a rather irregular pattern, which confirms that NBS did introduce adjustments to the results obtained through standard procedures.

It is difficult to understand why these adjustments were introduced into the nominal GDP revision. In fact, as we will discuss below, any ad hoc amendment to the nominal GDP estimates obtained by the standard procedures was really unnecessary because NBS (rather unexpectedly) bypassed the price problem in the revision of the real GDP growth estimates. Another question related to panel (B) in Figure 2 is that if the 1992 benchmark were indeed problem-free as assumed by NBS in this revision, why was the nominal service GDP in 1993 obtained through the standard procedures substantially upward adjusted?

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 the census and only in

Figure 3. Implicit GDP deflators for the service and construction sectors: Revised versus original estimates (1992 = 100)



Source: Author's calculation based on data from panels (D) and (E), Table 2.

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?

3.1 Changes in implicit deflators

Our investigation starts with the implicit GDP deflators of individual sectors reported in panels (D) and (E) of Table 2. Both the original and revised estimates-derived implicit deflators were converted into 1992-based indices to demonstrate the impact of the revision on price change over time. The results for services and construction are shown in Figure 3. We choose these two sectors because they were most affected in the revision, especially in nominal terms and hence in price deflators, and because the revision resulted in an opposite effect on the two sectors. 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.

This observation, together with Figure 1, which shows no revision to the real GDP growth rate in 1998, takes us back to the hot debate in the early 2000s about whether the statistical authorities had arbitrarily raised the growth rate for 1998 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 government's 8 percent growth target for that year, suggesting that the target was virtually met in a difficult economic situation. However, the 1998 growth rate has been challenged by many researchers as an overestimate of 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 ranged from –2 to +2 percent. But his estimation was criticized by Ren (2002) among others for lacking sound empirical support. Other researchers have used the expenditure approach (in contrast to the NBS's value-added approach) to arrive at different results. Keidel (2001) found the growth rate in 1998 to be between 6.9 and 7.2 percent, whereas Shiau (2005) showed that it was between 2.6 and 4.7 percent. 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 is surely in no position to face these challenges.

Unfortunately, the infamous “7.8 percent” for 1998 is a big dilemma that NBS could not easily bypass when revising China's real GDP growth rate. On the one hand, NBS could not systematically raise the 1998 growth rate together with the overall upward revision for the whole period because that would invite further international criticisms. On the other hand, it could not take this chance to make a reasonable downward revision for 1998 because that would amount to the admission that the original estimate was a 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 data revision less credible.

The 1998 anomaly 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 means that the under-

³ It should be mentioned that there are also different views. Using the principal component analysis, Klein and Ozmucur (2002) found that the variation of the official GDP growth was well associated with the variation of 15 major macroeconomic indicators, suggesting that the official GDP estimates were not outliers. Nevertheless, because 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 this debate.

coverage problem is mainly due to the new products and services that emerged after 1992. Because the prices of new products/services 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 and 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.

3.2 The government growth target

What is the government growth target? How could that target affect NBS's revision of the real growth estimates? The "state of the art" of the planning administration in China during the central planning era was "leaving room" [*liu you yu di*] for fulfilling annual or five-year plans (FYPs). Because being below the planned target was 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. Our hypothesis is that this outcome is largely the consequence of a game between the lower level and the upper level within the planning hierarchy. A great excess above 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 tap the potentials maximally. This may leave little room for overfulfilling the plan, however. In such a case the plan may be just met or marginally overshot (as seen in the 7th and 9th FYPs). One could also 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 that a marginal excess of the target is often followed by a downward adjustment of the planned target in the next FYP (as seen in the 8th and 10th FYPs).

In such an interactive process, changes in national plans can be rather erratic, and hence the macroeconomic performance tends to be volatile. For the current discus-

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

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 overshoot or undershot ^b	Growth target overshoot 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.

Source: Information on the growth target of various five-year plans is available from ECACE (Editorial Committee of Almanac of China's Economy) (various volumes) and the Web site of NDRC (National Development and Reform Commission) (<http://ghs.ndrc.gov.cn/>). The GDP growth rate for 2005 is 9.9 percent (as reported by the New China News Agent, 6 March 2006), which is used for calculating the average growth rate of the 10th FYP.

Note: 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.

n.a.: not available.

sion, 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, 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 performance⁵ under the Zhao Ziyang and Li Peng administrations from the mid 1980s to the mid 1990s has taught later governments some important lessons: growth should not be too fast so that the necessary macroeconomic balances can be maintained, especially in the energy, minerals, and transportation markets. However, growth has to be fast enough to create jobs and hence reduce the pain of the reform of the state sector.

Yet, how fast is 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 a "high growth rate that could be nine but below ten percent a year and low inflation that should not exceed three percent a year." Given this "rule of thumb," and the fact that high growth had already been achieved, there was really not much room for NBS to play in the revision. On the one hand, NBS strongly believed that the service GDP had been indeed underestimated (which would have some positive

5 See Woo (2006) for a recent analysis of the stop-go characteristic of the Chinese economy.

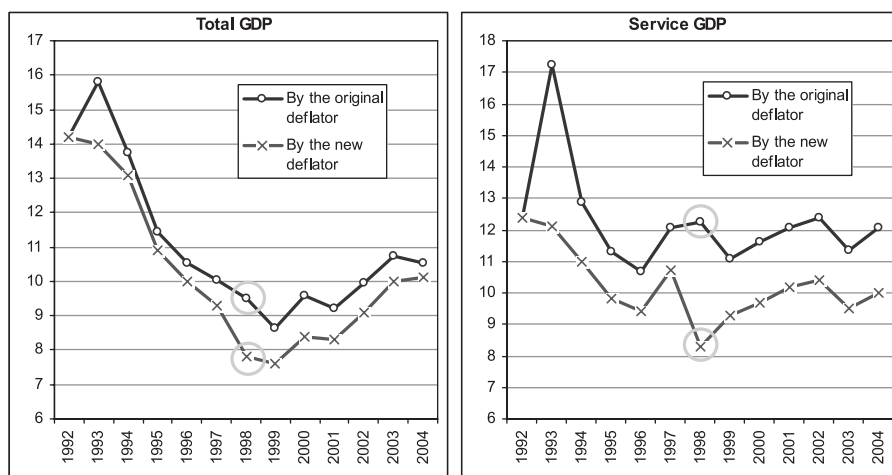
impact on the overall growth), and on the other hand, NBS found it politically difficult to adjust downward the real growth rate of any other sector. NBS might have tried several scenarios in the revision, but it looks to us that an annual growth rate of 9.9 percent was the most acceptable rate for the period 1992–2004. Because the impact of this upward revision on the entire reform (post-1978) period is merely 0.2 percentage 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 believe that China's post-reform GDP growth performance has already been exaggerated (e.g., Maddison 1998, 2006). Nevertheless, it indeed presents a much better FYP performance for the current administration, that is, the revised annual real GDP growth rate for the 10th FYP period (2001–05) is 9.4 rather than 8.8 percent (Table 4)!

3.3 What if the original deflators were adopted?

To support our growth target hypothesis, 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. Our results show that if the original NBS price deflators were used, the annual growth rate of China's GDP between 1992 and 2004 would be 10.8 per annum, instead of the revised rate of 9.9 percent, exceeding the "rule of thumb" target rate of 10 percent.

Figure 4 shows the effect of the original and the "new deflators" on 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 We want to highlight three points about Figure 4. First, the already overheated economy in 1993 as seen by the original data would be much worse (more out-of-control growth). Second, the Li Peng administration had claimed a "soft landing" in 1996 from the high growth of 1993. However, the use of original deflators would show GDP growth dropping from 15.8 percent in 1993 to 10.5 percent in 1996 rather than from 14.0 to 10.0 percent. Third, the widely criticized overstatement for the performance in 1998 when China was hit during the Asian financial crisis would look even more exaggerated (9.5 percent instead of 7.8 percent). All these findings are politically difficult to accept. Therefore, it is reasonable to believe that in the absence of "satisfactory" deflators, it was inevitable for NBS to work directly on the revision of the real growth estimates to ensure that the government's "rule-of-thumb" growth target would be met.

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), whereas the series deflated by the original deflators are from our calculation.

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.

3.4 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, that is, no adjustment to the CSY estimates for 1992 and 2004 (see panel (C), Table 2).

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). The comparison confirms our expectations. First, for all non-service sectors our results have exactly replicated what was reported by NBS, supporting our hypothesis that NBS had bypassed the price problem and worked directly on the revision of the real growth rates. Second, for services, we 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 create what we call “real value gaps” that should be compensated by opposite price effect.

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

Source: Author's calculation for Panel A.

Note: NBS revised estimates are from Tables 1 and 2.

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 an effect in this context a “price gap.” In the current case, a “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 5. Without “nominal gap,” one would expect to see the two gaps mirroring each other. Apparently, this is not the case, a situation that deserves further investigation.

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 can this be explained? In fact, what is missing here are NBS's ad hoc modifications to the nominal values that we 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 5 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.

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

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

Source: Author's calculation based on Table 5 for panel (A).

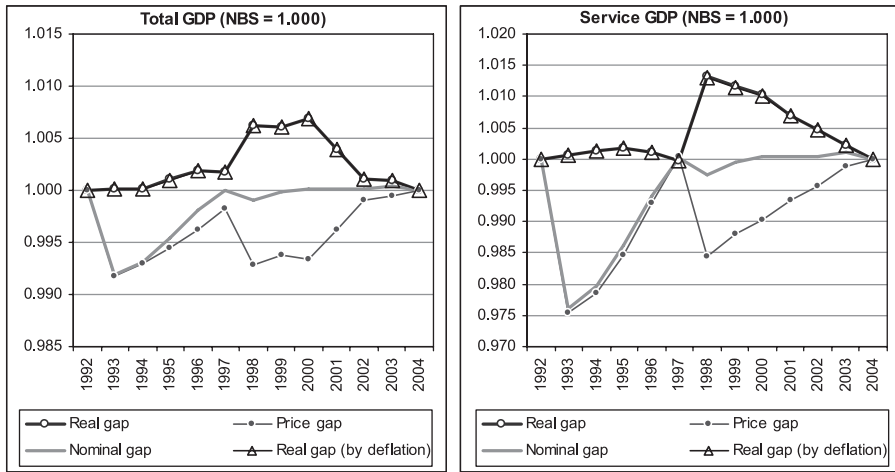
Note: NBS revised estimates are from Tables 1 and 2.

4. What if either of the two benchmarks is unreliable?

So far we have not challenged either 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 contrary to what some NBS statisticians believe. They feel that some services were not sufficiently covered in the 1992 census and afterward. 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 over time. 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 that were not fully addressed in the conduction of the census, which further substantiates 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 are largely driven by the political incentives of localities. As disclosed by Li Deshui, the former head of NBS, at the 2005 China People's Political Consultation Congress (CPPCC) in Beijing,

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.

if regional estimates were used instead, China’s GDP in 2004 would be 2,658 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*, 8 March 2005). Ironically, this 2,658 billion yuan of likely data inflation is coincidentally close to the 2,300 billion of underestimation discovered by the 2004 census.

Li’s point was made in March 2005 when NBS started processing the 2004 census data including crosschecking. However, NBS has not provided any information on how serious the local over-reporting problem is 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 reasonable to assume that NBS would have taken this census as a 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.

Furthermore, it is difficult to accept that other sectors are problem free. The state statistical reporting system has been widely criticized for misreporting for manufacturing industries, and one of the main purposes of the national economic census in

2004 was to compensate for the deficiencies of that system. According to Xu (2002), NBS has had to adjust rural industrial output downward since the 1990s after they discovered in the 1995 industrial census that 40 percent of the rural industrial output was overstated. In fact, some 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 eventually did not discover any significant output overestimation in manufacturing industries.

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

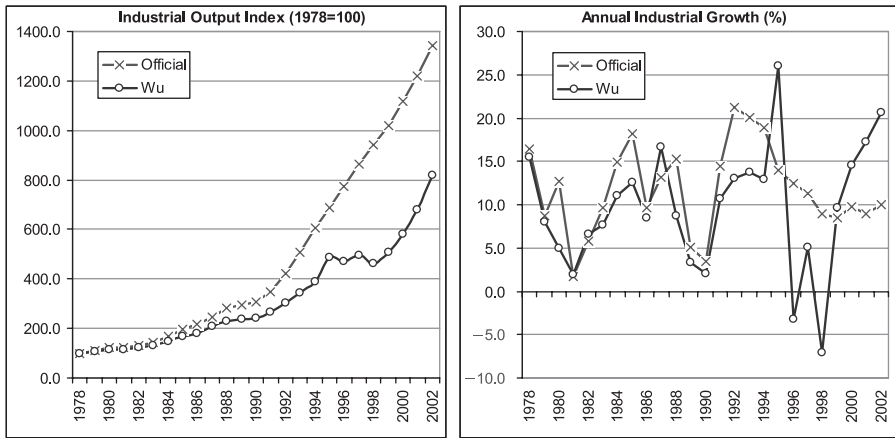
In addition, our estimates also suggest negative industrial growth in 1996 (–3.2 percent, at the time when the authorities claimed a "soft landing") and 1998 (–7.1 percent), which is in line with overall macroeconomic performance in China and the situation in the world economy, especially in the Asian financial crisis. Figure 6 also demonstrates that the official series of annual growth since the early 1990s is significantly less volatile than our series, suggesting that the actual volatility in industrial production might have been smoothed out to show more stable growth (because of "successful" macroeconomic management).

5. Concluding remarks

The census is unquestionably a serious effort by the Chinese statistical authorities' to improve the quality of China's national accounts. Our investigation in this paper

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 from business income by private firms was blown up to 1,009 million, or 12.6 times the actual value that was discovered by a NBS task force after an anonymous informant reported the information to the census authorities (*Southern Weekly*, 2 June 2005). One may reasonably wonder if this case is only the tip of iceberg.

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.

shows that the legacies of the traditional system and political constraints might have limited its effect. We hope that these findings will help initiate a constructive dialog among researchers to contribute to making national accounting in China methodologically sounder.

We close by touching on the always tempting question of “How fast has the Chinese economy grown?” (to quote Angus Maddison’s (2006) recent update of his estimate for China’s GDP growth). Maddison (2006) combines his work on agriculture and services with our work on industrial output, including the above-cited preliminary update to our 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 1990–2003 period compared with the official rate of 9.9 percent per annum in the 1992–2004 period. 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, which is still 1.5 percentage points below the official growth rate.

If the growth rate estimated by Maddison is closer to reality than the official estimates, then the existing growth accounting results on the productivity of the Chinese economy based on the official growth rate estimates are seriously flawed.

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