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ON THE CREDIBILITY OF GDP STATISTICS IN CHINA
OFFICIAL HISTORICAL DATA REEXAMINED

By KATSUHIDE TAKAHASHI

The reliability of China's GDP (Gross Domestic Product) statistics is an important issue that has recently been a topic of controversy. So far the image of high economic growth in China has been supported by the official GDP statistics issued by the government. This paper presents findings that challenge the credibility of these statistics. China's GDP statistics prior to 1985 turn out to be based on the Total Output Value of Society (TOVS), which is itself based on the MPS (Material Product System). This is a national economic accounting system used in former socialist countries. It is conceptually different from GDP statistics in the SNA (System of National Accounts), which is widely used in advanced countries. China is still in a transition period, but the shift has not yet resulted in a complete conversion to SNA. China adheres to the legacy of socialistic statistics, and does so as an expedient.

1. Introduction

In China an annual event takes place in late December. Chinese government leaders announce the GDP statistics growth rate for the year. In December 2001, President Jiang Zemin himself told the press corps that the GDP growth rate of China for 2001 had reached 7.3%. It is characteristic of the Chinese political landscape to determine and announce the GDP for a given year before the year actually finishes. However, how can they know the GDP figures in advance of the end of the year? Is it truly GDP statistics or something similar to GDP statistics? This is the starting point of our prime concern.

This paper shows that China's historical GDP is an adaptation of another statistic that was widely used in the planned economy era, namely the Total Output Value of Society (TOVS). In this paper, first, we will look at the volume of China's GDP in an international comparison to understand the growing presence of the Chinese economy. Next we will review the recent controversy over Chinese GDP statistics triggered by Rawski (2001) and Kojima (2003). We will add two points on the issue: 1) why is it that China's statistics can be announced so early compared with Japan or the United States, 2) why is it that in China even small cities can calculate their own GDP.

Then we will briefly discuss the conceptual difference between socialist statistics and capitalist ones, specifically MPS (Material Product System) and SNA (the System of National Accounts), respectively. Finally, we will test the hypothesis that the official GDP statistics traced back to 1952 by the government of China are an adaptation of the TOVS widely used in the era of planned economy, which were based on MPS.

At the conclusion of this paper we will see that China is in a transition period from MPS to SNA. This shift has not resulted in a complete conversion to SNA. We will see that China's

GDP statistical calculation system is an expedient that is considerably dependent on conventional MPS. The government's historical estimation of real GDP, traced back to 1952, suggests that it was dependent on the TOVS. China still adheres to the legacy of socialistic statistics. It is necessary that we use such statistics with prudence.

2. Background of the Issue: A High but Suspicious Growth Rate

Perhaps the most spectacular growth experience in recent history has been that of China. According to official statistics, the average annual growth rate of the Chinese economy was 9% from 1992 to 2002 while real GDP was growing at about 3% per year in the world as a whole. In spite of the period of pronounced financial turmoil that could be seen elsewhere in the late 1990's, China looked like a sea of calm and prosperity.

This remarkable high and stable growth has awoken great expectations for an ever-expanding market, as though the growth might continue forever. Now the largest portion of world FDI (foreign direct investment) has been invested in China and has made China effectively the workshop of the world. The Chinese GDP growth rate, which is extraordinary high by any standards, has brought praise and admiration but doubt and suspicion as well.

Needless to say, GDP is one of the most important and comprehensive economic statistics for a nation, and is the key indicator for macroeconomic analysis, macroeconomic policy and international comparison. Whether the growth rate is high or not in the long run has a strong influence on the international reputation of the country and on the behavior of investors.

The range of the argument on GDP extends from the economic sphere to the geopolitical sphere. When we look at the GDP statistics from a viewpoint of national power, economic strength, measured by GDP, is an important element on a par with military strength. Consequently, GDP statistics can affect matters of international relations or national security. Thus, the consideration of the statistical foundations of Chinese GDP has an essential importance. Fouquin & Lemoine (1998) wrote as follows:

"quality of data is necessary for correct assessment by investors. Bad quality data may have very high economic costs in terms of wrong decisions or in terms of risk premium."

Recently, some scholars have cast doubt on the reliability of Chinese GDP statistics. The controversy has created a sensation and there has been an elaboration of many pros and cons. The bigger the presence China has in the world economy, the hotter the debate becomes. We will return to this point in section 3.

3. Expanding Presence of China

The Chinese presence in the world economy is expanding every year. The next table shows a

ranking by volume of nominal GDP of major economic powers. Concerning this volume of nominal GDP, it turns out that China has already reached the level of European countries, ahead of Italy.

In this comparison, market exchange rates are used to convert foreign currencies into US dollars in order to compare the volume at a uniform standard. Including a PPP (purchasing power parity) converter, China ranks number two in the list, second only to the United States.

TABLE 1.

Comparison of NominalGDP(2001)

Ranking	Country	Unit$100 mil.	% Change year on year
			brackets indicate negative figure
1	US	100,822	2.6
2	Japan	41,757	(12.3)
3	Germany	18,549	(0.8)
4	Britain	14,226	(1.1)
5	France	13,110	0.4
6	**China**	**11,590**	**7.3**
7	Italy	10,896	1.5
8	Canada	7,054	(1.6)
9	Mexico	6,177	6.3
10	Spain	5,836	3.9
Data:	Cabinet Office of Japan		

4. Controversy over China's GDP

Maddison (1997) argued that the official Chinese estimates exaggerate growth and they understate the level of performance. Rawski (2001) criticized China's GDP statistics for lacking credibility based on the following observations: (1) despite its high economic growth,

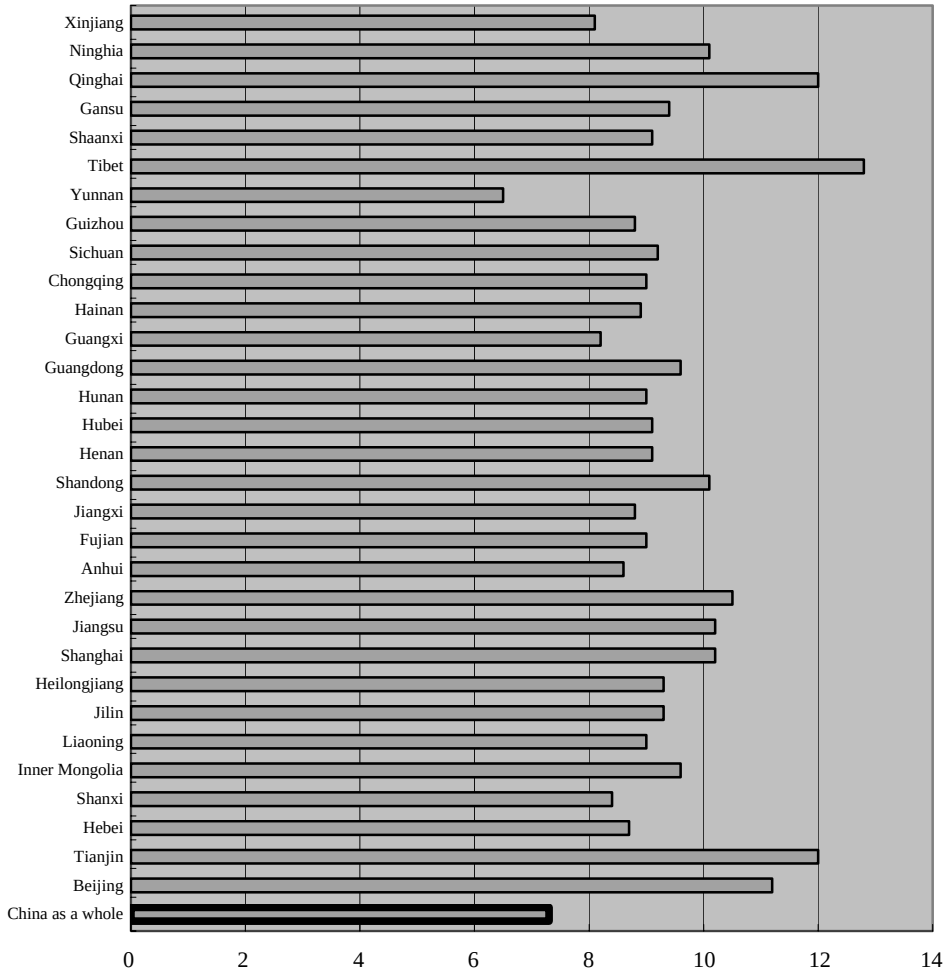
China's energy consumption has been decreasing; (2) China's overall growth rates are inconsistent with corresponding sector by sector growth rates; and (3) China has been enjoying stable economic growth despite widely fluctuating exports.

Kojima (2003) raised another question in that the national growth rates are inconsistent with those of provincial administrative bodies. Usually, the growth rates of almost all the provinces, cities, and autonomous regions are higher than the national growth rate. For example, in 1998, all provincial bodies except the Sinkiang Uighur autonomous region recorded higher growth rates than the national growth rate of 7.8%. Kojima concludes, "this seriously undermines the credibility of the growth rate statistics announced by the central government."

This is always the case with China's GDP statistics, as the published numbers show. The following chart indicates the growth rate of the each region and the national growth rate in 2001.

TABLE 2.

GDP Growth Rate by Region in 2001(%)



So far the expectation and desire for lasting high growth in China has drawn capital from all over the world. With such a high growth rate in the world's most populous country, the market promises to be huge. The higher the actual growth rate, the higher the expectation for further increases. These growing expectations for growth in China have created a virtuous circle of investment, production and export. However, are China's GDP statistics reliable and trustworthy? If the high growth rate turns out to have been a mirage, the image of China as a rising dragon may have to be corrected.

In addition to the criticisms of Rawski and Kojima there are other unusual matters concerning Chinese GDP. As mentioned above in section 2, China's GDP growth rate is announced by government leaders before the end of the year. How can they know the GDP figures in advance of the end of the year? How are they calculated? In general, it takes eight weeks in the United States and ten weeks in Japan to estimate preliminary figures, which are then revised within a period of a few months to become fixed figures. It is natural to doubt whether China's GDP is calculated with the same due process of estimation which takes place in advanced countries.

It is also strange that the figures government leaders announce before the end of the year are always identical to those announced officially by the National Bureau of Statistics, the department responsible for statistics. This suggests that the government decides a fixed figure for the GDP of the year by the end of December and the top leaders are aware of this.

Moreover, it is also questionable that even cities are able to calculate and announce their own GDP in China. In the case of Japan, usually it takes 20 months for prefectural governments to calculate and announce the GDP. Small cities, towns and villages in Japan cannot compute GDP for technical and budgetary reasons. This is also the case in the U.S.

By contrast, in China many cities announce their own GDP growth rate almost at the same time as the central government. The figures are usually higher than national GDP figures. In recent years they have often exceeded 10% or more. Kojima's (2003) criticism would seem to be valid. These figures must be something other than GDP.

Judging from experience and practice in advanced countries, it is impossible to estimate the GDP of the year before the year finishes. It is hardly possible for small cities to calculate their own GDP independently. What then, is the substance of the would-be GDP statistics of China? What do the official GDP figures of small cities really indicate? We can reasonably induce that the national and regional statistics are alike in appearance but quite different in nature.

5. From MPS to SNA

Wu (1997) wrote that "measuring China's GDP is no easy task. Since the early 1950's, national accounting, price statistics, and statistical practices in general have been strongly influenced by the Marxian material product system."

For a long time, China's GDP statistics prior to 1978 were blank, mainly due to the Cultural

Revolution. In 1998, for the first time in history, China announced GDP statistics for the period of 1952-1978. The government stated that these were conforming with the 1993 United Nations SNA, and not following the MPS. (We will further discuss the difference between SNA and MPS in section 6).

However, it seems that the historical estimation of the past is substantially dependent on the TOVS. In the next section, we will statistically demonstrate this point. Before moving to the hypothesis tests in the next section, we will explain some conceptual issues in this section.

The essential difference between GDP and TOVS is the treatment of intermediate goods. GDP is the total production of final goods, which excludes intermediate goods. TOVS under MPS is the sum of production in physical terms. In other words, intermediate goods are double counted in TOVS. It seems that the historical estimation towards the past is substantially dependent on the TOVS.

As we will see in the next section in detail, the GDP real growth rate which China announces every year is most probably based on the TOVS under MPS. It differs from the value added base, which is the essential feature of GDP under SNA. Still, the Chinese GDP statistics are an amalgam or hybrid of the SNA and MPS. Therefore it is not appropriate to compare China's statistics with the GDP statistics in the advanced nations.

6. Difference in Concepts between MPS and SNA

In this section, we overview the transitional changes of the National Accounting System in China. The national economic accounting system of the former-socialist economies was called MPS (Material Product System). The concept and method of national economic accounting in China greatly differed from capitalist countries.

Wu (1997) explained this point concisely as follows: "In the early 1950s, China adopted MPS from the Soviet Union with a central planning system. The MPS artificially divided economic activities into 'material production' and 'nonmaterial production', and measure output in quasi-physical terms in line with the physical targets of national plans."

Under MPS, service sectors, including passenger transport, health service, and education are considered not directly linked to material production. In short, service sectors in general are excluded from national accounts. However, the parts of shipping, freight traffic, distribution, and communication that are relevant to material production are included under material production.

In accordance with Marx's labor theory of value, China believed that only material production could create value. In this theory, the process of commodity circulation itself does not yield any value.

Under MPS the *total output value of industry and agriculture* had been prominent as an important macroeconomic indicator since the establishment of the People's Republic of China in 1949. Total output value of industry and agriculture is the sum of material products and

agricultural products, including the value of intermediate goods. The value of intermediate goods are overlapped or double counted.

Until 1985, *total output value of industry and agriculture* was used as an index representing the macro economy. For example, the 12th National People's Congress in 1984 declared a national target that China should increase the annual *total output value of industry and agriculture* to four times the level of 1980 by the end of the 20th century.

However, in 1994 China stopped making the figure public. The China statistical yearbook in 1993 is the last record of the total *output value of industry and agriculture*

The above-mentioned TOVS was also an important indicator, which sums up output value industry, agriculture, construction, transportation (including postal administration and communications), and commerce (including food and beverages, as well as services).

This item also hasn't appeared in the China statistical yearbook since 1994. In the next section we will examine the relationship between TOVS and GDP. The next table shows the transition of TOVS and its growth rate from the previous year. The growth rate of the would-be real GDP is also listed for comparison.

TABALE 3. Comparison of TOVS and GDP

	Total Output Value of Society	Real GDP Growth Rate
Year		% change, yoy
1953	22.3	15.6
1954	8.5	4.2
1955	5.1	6.8
1956	15.8	15.0
1957	-2.0	5.1
1958	33.1	21.3
1959	19.2	8.8
1960	5.1	-0.3
1961	-26.2	-27.3
1962	-9.0	-5.6
1963	8.7	10.2
1964	16.0	18.3
1965	18.8	17.0
1966	13.6	10.7
1967	-9.4	-5.7
1968	-4.5	-4.1
1969	20.2	16.9

1970	19.3	19.4
1971	10.6	7.0
1972	4.6	3.8
1973	8.6	7.9
1974	1.7	2.3
1975	10.7	8.7
1976	1.0	-1.6
1977	10.5	7.6
1978	14.0	11.7
1979	11.6	7.6
1980	11.7	7.8
1981	6.3	5.2
1982	9.8	9.3
1983	11.7	11.1
1984	18.3	15.3

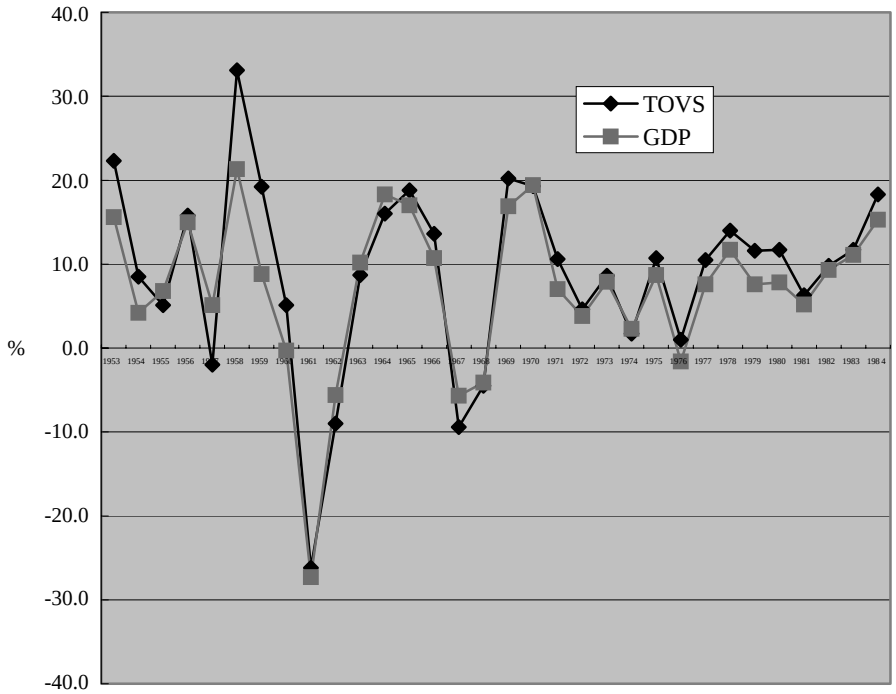


FIGURE 1. Growth Rate of real TOVS and real GDP

7. Hypothesis Testing

As we have observed in the preceding section, there is a strong resemblance in the annual growth rate between GDP and TOVS. In this section, statistical testing will verify the observation.

First we will conduct an analysis of variance, then we will test the difference of the two means. Unless we prove the two sets of data have equality of variance, we cannot go on to the test of two means.

7.1 Testing the difference between two variance: GDP and TOVS

First, we wish to examine whether the variance of the GDP is different from the variance of TOVS. In our context variance represents the volatility of the growth rate year by year.

The two sets of data to be tested are listed in the table on page 85.

Using $\alpha = 0.05$, is there enough evidence to deny the claim? The following process answers this question.

We state the hypothesis and identify the claim as follows:

$$H_0 : \sigma_1^2 = \sigma_2^2$$

$$H_1 : \sigma_1^2 \neq \sigma_2^2$$

Where

σ_1 = variance of GDP

σ_2 = variance of TOVS (Total Output Value of Society)

In order to find the critical value we use the 0.025 table in the F-distribution since $\alpha = 0.05$ and this is a two-tailed test. Here, d.f.N. =32-1=31 and d.f.D=32-1=31. The critical value is 1.8221. We compute the test value.

$$F = \frac{123.4331}{89.0373} = 1.3863$$

We do not reject the null hypothesis. Since 1.3863<1.8221.

There is not enough evidence to deny the claim that the variances of the GDP and TOVS are different.

Summary Table

Sample Sizes	GDP 32	TVOS 32
Variance	123.4331	89.0373
Test value	1.3863	

Level of significance	a=0.05
CriticalValue	1.8221
Null hypothesis	Not rejected

This result clearly suggests that GDP and TOVS statistics examined in this paper have the same variance and thus the same volatility.

7.2 Testing the difference between two means: GDP and TOVS

Next we will go on to the test of difference in the means between GDP and TOVS. If both populations have the same mean, then most of the differences will be zero or close to zero. In the comparison of two sample means, the difference may be due to chance, in which case the null hypothesis will not be rejected, and we can assume that the means of the populations are basically the same.

On the other hand, if the difference is significant, the null hypothesis is rejected and we can conclude that the population means are different.

The two sets of data to be tested are listed on page 85.

Using $\alpha = 0.05$, is there enough evidence to deny the claim? The following process answers this question.

We state the hypothesis and identify the claim as follows.

$$H_0 : \mu_1 = \mu_2$$

$$H_1 : \mu_1 \neq \mu_2$$

where

μ_1= mean annual growth rate of GDP

μ_2= mean annual growth rate of TOVS(Total Output Value of Society)

We find the critical values. Since $\alpha = 0.05$, the critical values are +1.96 and -1.96.
We compute the test value as t=0.6755.
We do not reject null hypothesis at d=0.05, since 0.6755<1.96
There is not enough evidence to deny the claim that the means are equal.

Summary Table

	Mean	Variance
TVOS	8.9281	123.4331
GDP	7.1875	89.0373

Degrees of freedom	62
Level of significance	0.05
Test value	0.6755
P-value	0.5019
Null hypothesis	Not rejected

We can conclude that GDP and TOVS in China have been generated from the same population. To put it bluntly, it can be said that they have same origin. This is the most important finding of the present paper.

Apparently GDP was created as a continuation of the previous TOVS system.

8. Concluding Remarks

The arguments involving China's GDP can seem to take on the degree of complexity of a labyrinth. This paper has shown statistically that the data of historical GDP and TOVS are generated from the same population. To put it simply, the latter is a replica of the former.

China's GDP embodies evidence which shows that it is conceptually different from the GDP in the western countries. In order to clarify this point, we focused on and examined the long time series of *Total Output Value of Society*, which was one of the most important macroeconomic indicators in the planned economy. Specifically, we found that official long-term GDP figures prior to 1985 can be traced back to the *Total Output Value of Society*.

China is gradually shifting to the universal statistical standard but the process of change is still under way. What we have shown suggests that China's GDP statistics are used as an expedient, and that they are still considerably dependent on conventional MPS. It would be inappropriate to compare these statistics with GDP statistics in Western countries because the two kinds of statistics are calculated by different processes.

However, China should not necessarily be blamed for this situation. In the not-too-distant past China saw an era of political turmoil, including the destructiveness of the Cultural Revolution. Any government to face such difficulty would require time to adjust. It is a change of Copernican order for China to convert from MPS to SNA.

We stress here that the GDP statistical system in the advanced countries is far from perfect.

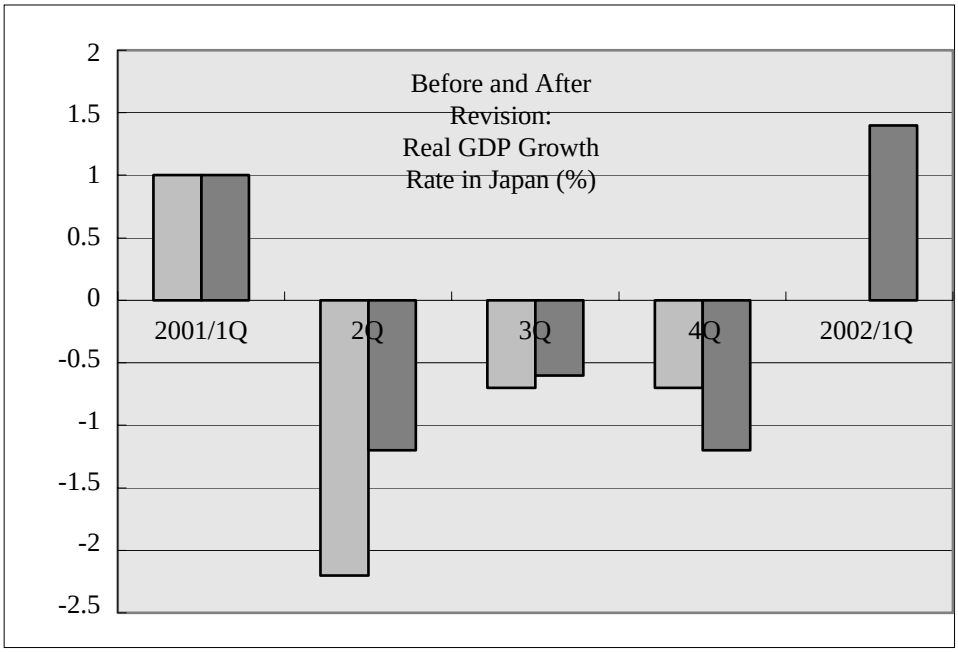


FIGURE 2

As an example, we will look at the case of Japan, which changed the method of estimating GDP in 2002. The following bar chart indicates the real GDP growth rate (annual rate compared with the preceding term - seasonally adjusted) of Japan.

The gray bars show the real GDP as calculated before the revision and the black bars show the real GDP as calculated after the revision. It is apparent that the difference between the before and after conditions is quite large. If we judge business conditions according to the pre-revision method, the Japanese economy in the 1st Quarter in 2002 was suffering from a rate of economic growth of about zero. On the other hand, if we use the post-revision method, business conditions appear to have entered a recovery process. In this way, GDP statistics can be easily changed even in Japan and the United States. As a result we often have to reconstruct our image of the economy and alter our judgments of the level of risk.

Nevertheless, China should not be held free of the responsibility to improve the transparency of its statistics. China should be held to an international standard now that it is one of the biggest players in the global economy.

Some other problems should be amended. Under the *status quo*, the GDP deflator of China is unknown because China does not announce it. Also, China should announce quarterly GDP statistics with a breakdown by every demand component as is done in advanced countries. The lack of quarterly data is one of the substantial limitations of China's GDP.

It is necessary to improve the overall reliability of Chinese GDP statistics in order to maintain world-wide investor approval.

According to the *China Daily* of August 14, 2003, China is expected to offer the most accurate statistics ever on its GDP this year but it will take at least another three years to fix all of the problems in the system.

(Note 1) A counterargument asserts that the Chinese energy structure is changing from coal to oil rapidly and that efficiency is improving dramatically.

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