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What is the Real Size of China's Economy?

Dianqing Xu*

University of Western Ontario and CCER, Peking University

Christer Ljungwall**

Stockholm School of Economics and China Center for Economic Research, Peking University

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**Corresponding author. Mailing address: China Center for Economic Research at Peking University, Haidian, Beijing 80078, P.R China. Phone: +86-10-62758988. E-mail: chrlju@ccer.edu.cn

Abstract: On December 20, 2005, China's National Bureau of Statistics adjusted China's nominal GDP by CNY 2.3 trillion. The bulk of this upward adjustment was attributed to improved coverage of value-added by services. The service industry now makes-up 40 percent of GDP. Based on previous studies and other observations, this paper point out that there is still significant under-reporting of the service industry and, hence China's GDP is likely to be underestimated. We find a plausible share of service industry in GDP to be in the range of at least 45 percent to 55 percent.

Key Words: China, National Account
JEL CODE: E01, O53

I. Introduction

The Chinese economy has undergone a massive transformation over the past two decades. Economic growth has been high, averaging 10 percent per annum, and there has been a sustained change in the nature of the economy. These changes can be viewed through the changing shares of total gross domestic product (GDP) produced by the primary, secondary and tertiary sectors. Similarly, the national account is endogenous with the economic system and provides intrinsically important information of the economy. To remain up-to-date with the rapidly evolving Chinese economy the National Bureau of Statistics (NSB) has implemented a series of changes in the way output and income is calculated and reported.

The most visible change in this respect has been the adoption of the *System of National Accounts* (SNA). An essential part of this transition has been the need to have accurate benchmarks for the output of all sectors, but in particular, the rapidly evolving service industry previously neglected in the *Material Product System* (MPS). Despite improved coverage of the service industry, this paper show that China's GDP is likely to remain underestimated and suggest a plausible share of service industry in GDP to be in the range of at least 45 percent to 55 percent. Our results show that the U.S GDP, as measured by PPP, range between 129.1 percent and 97.8 percent of China's GDP, while that of Japan range between 41.5 percent and 31.4 percent, depending on the share of service industry in China's GDP.

The remainder of the paper is organized as follows. The next section present the adjustment made to GDP. Section III briefly describes the national accounting system,

and section IV point at some of the problems involved in measuring value added in the service industry. Section V discusses structural change and the share of service industry in GDP, and section VI re-calculate the size of China's GDP. Section VII concludes.

II. The Adjustment of China's National Account

On basis of the 2004 national economic census, China's National Bureau of Statistics (NBS) on Dec. 20, 2005, announced that nominal GDP in 2004 was upward adjusted from CNY 13.6 trillion to CNY 15.99 trillion. That is, an increase by CNY 2.3 trillion or 16.8 percent. While there were only minor changes of agriculture and industry, the service industry increased by an astounding CNY 2.13 trillion, thus accounting for 93 percent of the total adjustment. Transport and communication, trade and catering, and real estate – which together make up close to 50 percent of tertiary sector output – accounted for 75 percent of the revision to tertiary sector value added.

Table 1 shows GDP and its growth rates before and after the adjustment. As first noted, the adjusted 2004 GDP figure is 36 percent, or CNY 4.2 trillion, higher than the un-adjusted GDP for 2003. Obviously, such comparisons make little sense unless similar adjustments are adhered to for previous years and, hence the values of previous years were adjusted backwards to 1993[1]. The adjusted values indicate that GDP has not only become significantly larger but also suggest higher growth rates.

< TABLE 1 ABOUT HERE >

Table 2 shows GDP and its composition before and after the adjustment. The share of agriculture and industry was downward adjusted by 2.1 and 6.7 percentage-points respectively, while the share of service industry was correspondingly upward adjusted by 8.8 percentage-points and reached 40.7 percent of GDP. The latter is equal to a nominal increase of CNY 2.13 trillion.

< TABLE 2 ABOUT HERE >

One important thing to note here is that neither of the 1993 or 2004 economic consensuses obtains information on price changes, which implies that GDP deflators are insufficiently sensitive to the underlying rate of inflation. That is, the extent to which the new deflators are able to compensate for the newly found nominal value added may affect real GDP and its growth rates (Wu, 2006)[2].

National accounts measurements in any country are rarely definite and although the series for most countries are relatively stable and consistent over the years, they are always subject to minor adjustments. The scale of adjustment to China's GDP, however, makes China an unusual phenomenon. The question is whether this adjustment is reasonable. As we shall see, it is not only reasonable, but also in line with our expectation.

III. Two Accounting Systems

There are two main accounting systems in the world: Material Product System (MPS) and System of National Accounts (SNA). MPS mainly describes the flow of material in the

process of production and trade, while SNA include the economy's immaterial service industry.

The MPS, which is used to calculate Gross National Product (GNP) was the only system in use between the years 1952 to 1984. The service industry was completely ruled-out in this system. Both systems were then in parallel use between 1984 and 1992, and the NSB reported both GNP (calculated with MPS) and GDP (calculated with SNA). Contradictions were unavoidable. At the "26th Statistical Committee Conference" held by the United Nations in 1991, most participating countries agreed that SNA should be the standard means for calculating national accounts. In 1992, China enacted the "Scheme on System of National Account in China 1992". From then onwards the methods used by NSB to calculate and report data, such as the use of; input-output tables, capital flow tables, balance-of-payment sheets, and so forth, have converged to international standards (although not yet problem-free) and the MPS was phased out gradually. These actions have led to drastically improved information about the Chinese economy.

Also The World Bank and other prime international organizations paid attention to the estimation methods used to calculate China's GDP. The World Bank anticipated a possible under- or over-estimation in self-consumed crops, welfare service, and subsidies to loss-making firms. This attempt was, however, over-shadowed by the multiple standards in rural service industry, housing service, rural industries and agricultural by-products, thus rendering it impossible to derive exact measurements. In 1999 the World Bank conducted an exhaustive survey of the sources and statistical methods used to calculate China's GDP, which later led the World Bank to accept the official statistics

on GDP in China.

In April 2002, China joined the General Data Dissemination System (GDDS), which meets the requirement set by the International Monetary Fund: Data Characteristics; Data Quality; Completeness, and; Public Access. Later, on Dec. 23, 2003, Beijing held a meeting on national statistics, leading to further improvement in calculation methods and data dissemination, and a reform of the national economic consensus. Although there remains a lot of problem in the calculation of China's GDP, changes are implemented and the trends are optimistic. A complete make-over of a country's national accounting system is a daunting task with long delays, particularly in rapidly transforming economies as that of China. Other sectors are not problem-free, but by definition, the service industry is very difficult to cover completely.

IV. Measurement Problems in Service Industry

There are some major problems in estimating value-added by the service industry in China. The system is plagued by data inconsistency, incomplete scopes, and a troubled but improving data reporting system. In addition, China's service industry is characterized as large in scope, diversified type of operation, and with disperse mode of management. The standards for categorizing different industries are also different across countries. In China, the industries other than agriculture and traditional industry are all categorized into service industry. It is generally categorized into four main sectors.

The first sector includes traffic, transportation, storage, postal service, and communication. This sector is also the easiest to measure. The second sector includes

wholesale, retail and trade; the third includes catering and entertainment, and; the fourth includes domestic economy (e.g. hairdresser, repair work, and so forth). Part of the latter three sectors is an unknown level of un-taxed economic activities that are difficult to measure [3]. These sectors include tens-of-thousands of small and medium-sized entrepreneurs and millions of hourly laborers – there are, for example, some 20 million maids working on their own and by the hour in China. A majority of these activities are not reported and taxes not paid. With a rapidly evolving service industry as that in China, the under-coverage of service industry is likely to be significant and result in underestimation of China's GDP.

China has gone through major tax reforms in the last two decades. Significant measures to improve governance in taxation were implemented, including unifying tax laws, equalizing tax burdens, simplifying the tax system, and so forth. However, more needs to be done to improve China's tax system in order to mitigate the problem of large un-taxed economic activities and it is essential that a system is designed that encourages entrepreneurs of all forms and individuals to report their full revenue in the taxation process. One way, and perhaps the simplest one, would be to introduce a system of tax deduction schemes.

This implies that employers rather than the discrete employees should be encouraged to report the data. Such a tax rebate would allow employees of small entrepreneurs and individuals to deduct the wage-cost of their employees / hourly laborers from their income. Under such circumstances, theoretically, the employer distributes their own revenue to another individual but do not have to pay tax for this

wage, i.e., they receive a tax rebate and, hence if the employer's marginal tax rate is high the incentive to report the data rises. In return, it would to some extent force employees and hourly laborers to report their own income. With the same logic, a tax rebate policy would encourage small entrepreneurs to report their output.

Such actions would drastically minimize unintended distortions, and improve national accounts data. At present stage, however, with the tax system still undergoing significant change, full coverage of the service industry will not be met within a considerable time, and under-coverage of the service industry is unavoidable.

V. Structural Change and Share of Service Industry in GDP

In the 1950s, Kuznets concluded that the process of economic development is strongly associated to changes in the structure of the economy[4]. A growing economy is one that becomes more complex and sophisticated in time in terms of the creation of new sectors of economic activity and the entry of new, more knowledge-intensive, forms of production organization. The share of agriculture will gradually decrease and the share of non-agricultural sectors in total output will rise.

For more than two decades, China has introduced market-oriented structural reforms, opening-up its domestic economy to foreign competition, de-regulating markets, and privatizing economic activities. These reforms involved a major departure in policy regime from the one that prevailed before the 1980s. The new policies induced a major transformation of the social, economic, and institutional environment for China. As a result, China has undergone undisputable changes in their production structure,

international competitiveness and pattern of development.

Undoubtedly, a large number of new economic activities have emerged in the Chinese economy since the early 1980s, while many of the former ones have gradually disappeared. Indeed, anyone who has lived or worked in China for a longer period bear witness to the immense development in recent years in all aspects of the service industry. A service industry of the type once found only in Western developed economies is today available in – but not confined to – all the larger cities, and in all corners of China. And as the economy grows and modernizes, the service industry grows with it.

Given this observation, the share of value added by service industry in GDP would have experienced significant increases over China's past two decades of rapid economic development. Table 3 displays the level of GDP and sectoral composition in 24 countries[5].

< TABLE 3 ABOUT HERE >

The PPP-figure indicates that while China's economy is substantial, its standard of living fall far below that of the U.S, Canada, United Kingdom, Japan, and Germany. On the other hand, China's standard of living is higher than that of India, The Philippines, Pakistan, and Zimbabwe. Table 4 reorganizes the countries by the share of service industry in GDP.

< TABLE 4 ABOUT HERE >

Here, we notice that the share of service industry in GDP is larger than 65 percent in countries with GDP per capita above USD 25 000 (the exception is S. Korea with a per capita GDP of USD 24 500 and a share of service industry of 67.2 percent). In countries with GDP per capita in the range of USD 10 000 – 25 000, typically the share of service industry is between 58-65 percent (the exception is India with 60.7 percent and Malaysia with 43.6 percent), while the share is below 58 percent in countries with per capita GDP generally less than USD 10 000.

Notably, and of prime interest for the present analysis, the share of service industry in GDP for China (40 percent) is far below even the poorest country in the sample (Zimbabwe 59.4 percent). As a matter of fact, if we look at all countries in the sample with a per capita GDP less than USD 10 000, the average share of service industry in GDP is 50 percent. In particular, India, The Philippines, Pakistan, and Zimbabwe have higher shares of service industry in GDP than China has – but their per capita GDP is substantially lower than that of China. This is hardly plausible. Definitely, the overall economic development in China is respectably higher than in Zimbabwe and Pakistan and, but to a lesser extent, higher than in India and the Philippines.

If we think of China as being more developed compared to the previously mentioned economies, it is not unreasonable to expect China to have at least a similar or even higher share of service industry in GDP. Hence, the data provided in Table 4 suggests that the share of service in China's GDP should be in the range of at least 45 percent to 55 percent. That is, the estimated share of 40 percent is likely to be too small and, hence China's GDP is likely to be underestimated by some amount.

VI. Adjusted GDP

If we use the PPP-adjusted GDP for 2006 as the benchmark, keep the output in agriculture and industry unchanged, and make adjustment only to the service industry by increasing its share in GDP to 45, 50, and 55 percent respectively, a quick number-exercise give the new figures for China's GDP (see Table 5).

< TABLE 5 ABOUT HERE >

These numbers become more interesting when we compare how China ranks to the sample countries. To do this, we take the values provided in Table 3 and set China as the benchmark (100 percent). Table 6 provides the results. Here, the USD 13.13 trillion U.S GDP is in the range of 129.1 percent to 97.8 percent of the Chinese GDP. Similarly, the USD 4.22 trillion Japanese GDP lie in the range of 41.5 percent to 31.4 percent depending on the different adjustment schemes (see Table 5) used to calculate the size of China's GDP. India, with a share of service industry in GDP of 60 percent, range between 40.9 percent and 31.0 percent of China's GDP, while the poorer countries like the Philippines, Pakistan, and Zimbabwe range between 4.4, 4.3, 0.3 to 3.4, 3.3, and 0.2 percent respectively.

< TABLE 6 ABOUT HERE >

Although this exercise may be somewhat arbitrary, these numbers at least crudely point out the direction and is likely to show more accurate levels of China's GDP (less under-reporting of service industry) and, hence the comparison with the other countries become more relevant.

VII. Summary

On the basis of the 2004-economic census, China's National Bureau of Statistics on December 25, 2005 announced that nominal GDP was upward adjusted from CNY 13.6 trillion to CNY 15.99 trillion. While there were only minor changes to agriculture and industry value added, service industry value added increased by CNY 2.13 trillion. In line with the prediction by Kutznets in the mid-1950s, more than two decades of high economic growth and rapid structural change in China has led to a rapid evolving service industry.

Today, China's service industry is characterized as large in scope, diversified operations, and with disperse mode of management. It comprises tens-of-thousands of small and medium-sized entrepreneurs and millions of hourly laborers. A majority of their activities are not reported and taxes are not paid. This is likely to result in underestimation of China's GDP. The key to mitigate the problem of a large un-taxed economy is to further reform the tax system, and design an incentive mechanism that encourage entrepreneurs of all types to report their full revenue.

This paper shows that despite the upward adjustment following the 2004-economic consensus, China's GDP remain underestimated and suggest the share of service

industry in GDP to be in the range of at least 45 percent to 55 percent. In the former case, this would leave the U.S GDP (measured in PPP) in 2006 at 118.3 percent the size of China's GDP, while that of Japan would be 38.0 percent of China.

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Table 1. China's Gross Domestic Product, 2000 – 2004 (CNY 100 million)

	Non-adj GDP	GDP* growth %	GDP** growth %	Adjusted GDP	GDP* growth %	GDP** growth %
2000	89 468.1	9.0	8.0	99 214.6	10.6	8.4
2001	97 314.8	8.8	7.5	109 655.2	10.5	8.3
2002	105 172.3	8.1	8.3	120 332.7	9.7	9.1
2003	117 390.2	11.6	9.5	135 822.8	12.9	10.0
2004	136 875.9	16.6	9.5	159 878.3	17.7	10.1
2005	NA	NA	NA	183 084.8	14.5	10.2
2006***	NA	NA	NA	209 400.0	14.4	10.7

Source: China Statistical Yearbook, 2006. GDP calculated at exchange rates. *GDP growth calculated at current prices. **GDP growth calculated at constant prices. ***Estimated numbers for 2006.

Table 2. Adjusted Gross Domestic Product, year 2004 (CNY 100 million)

	Agriculture	Industry	Service	Sum
Original data	20 768	72 387	43 720	136 875
Share (%)	15.2	52.9	31.9	100
Adjusted data	20 956	73 904	65 018	159 878
Share (%)	13.1	46.2	40.7	100

Source: China Statistical Yearbook, 2006. GDP at current prices.

Table 3. GDP and its Composition in 24 Countries, 2006. (USD 100 million)

	GDP (PPP)	GDP (Ex. rate)	Per cap. GDP	Agriculture (%)	Industry (%)	Service (%)
U.S.A	13 130	13 210	44 000	0.9	20.4	78.6
China	*10 170*	*2 518*	*7 700*	*11.9*	*48.1*	*40.0*
Japan	4 218	4 883	33 100	1.6	25.3	73.1
India	4 156	804	3 800	19.9	19.3	60.7
Germany	2 630	2 872	31 900	0.9	29.1	70.0
United Kingdom	1 930	2 346	31 800	1.0	25.6	734.4
France	1 891	2 149	31 100	2.2	20.6	77.2
Italy	1 756	1 785	30 200	2.0	29.1	69.2
Russia	1 746	733	12 200	5.3	36.6	58.2
Brazil	1 655	967	8 800	8.0	38.0	54.0
S. Korea	1 196	897	24 500	6.3	26.4	67.2
Canada	1 178	1 088	35 600	2.3	29.2	68.5
Indonesia	948	265	3 900	13.1	46.0	41.0
Turkey	635	358	9 000	35.9	22.8	41.2
Thailand	596	198	9 200	10.0	44.9	45.2
Poland	552	337	14 300	4.8	31.2	64.0
The Philippines	450	117	5 000	14.2	32.1	53.7
Pakistan	437	124	2 600	22.0	26.0	52.0
Malaysia	314	132	12 900	8.3	48.1	43.6
Romania	202	80	9 100	10.1	34.7	55.2
Czech Rep.	224	113	21 900	4.1	37.6	58.3
Hungary	175	28	17 600	3.1	32.1	64.8
Bulgaria	79	28	10 700	13.6	3.1	54.3
Zimbabwe	25	3.2	2 100	17.7	22.9	59.4

Source: CIA World Fact Book, 2006. Estimated 2006 figures. GDP=Gross Domestic product, PPP=Purchasing Power Parity, Ex. Rate=Exchange Rate.

Table 4. Countries Organized by Share of Service Industry in GDP (%)

	Agriculture (%)	Industry (%)	Service (%)
U.S.A	0.9	20.4	78.6
France	2.2	20.6	77.2
United Kingdom	1.0	25.6	73.4
Japan	1.6	25.3	73.1
Germany	0.9	29.1	70.0
Italy	2.0	29.1	69.0
Canada	2.3	29.2	68.5
Hungary	3.1	32.1	64.8
Poland	4.8	31.2	64.0
India	19.9	19.3	60.7
Turkey	11.2	29.4	59.4
Zimbabwe	17.7	22.9	59.4
Czech Rep.	4.1	37.6	58.3
Russia	5.3	36.6	58.2
Romania	10.1	34.7	55.2
Bulgaria	13.6	32.1	54.3
Brazil	8.0	38.0	54.0
The Philippines	14.2	32.1	53.2
Pakistan	14.2	32.1	52.0
S. Korea	3.0	45.0	52.0
Thailand	10.0	44.9	45.2
Malaysia	8.3	48.1	43.6
Indonesia	13.1	46.0	41.0
China	*11.9*	*48.1*	*40.0*

Source: CIA World Fact Book, 2006. Estimated 2006 figures.

Table 5. GDP Adjustment Schemes, Benchmark Year 2006. (USD 100 million)

	Share of service industry	Agriculture	Industry	Service	GDP (PPP)
Benchmark	40.0	1 210.2	4 891.8	4 068	10 170.0
Scheme 1	45.0	1 210.2	4 891.8	4 992.5	11 094.5
Scheme 2	50.0	1 210.2	4 891.8	6 101.9	12 203.9
Scheme 3	55.0	1 210.2	4 891.8	7 322.3	13 424.3

Source: CIA World Fact Book, 2006. Authors own calculations. PPP=Purchasing Power Parity. Estimated numbers for 2006.

Table 6. GDP and the Relative Size of Economies. (USD 100 million, PPP)

	GDP PPP	Relative China %	Scheme 1 (45%)	Relative China %	Scheme 2 (50%)	Relative China %	Scheme 3 (55%)	Relative China %
U.S.A	13 130	129.1		118.3		107.6		97.8
China	10 170	100.0	11 095	100.0	12 204	100.0	13 424	100.0
Japan	4 218	41.5		38.0		34.6		31.4
India	4 156	40.9		37.5		34.1		31.0
Germany	2 630	25.8		23.7		21.6		19.6
U.K	1 930	19.0		17.4		15.8		14.4
France	1 891	18.6		17.0		15.5		14.1
Italy	1 756	17.3		15.8		14.4		13.1
Brazil	1 655	16.3		14.9		13.6		12.3
Russia	1 746	17.2		15.7		14.3		13.0
Canada	1 178	11.6		10.6		9.7		8.8
S. Korea	1 196	11.8		10.8		9.8		8.9
Indonesia	948	9.3		8.5		7.8		7.1
Turkey	635	6.2		5.7		5.2		4.7
Thailand	596	5.8		5.4		4.9		4.4
Poland	552	5.4		5.0		4.5		4.1
Philippines	450	4.4		4.1		3.7		3.4
Pakistan	437	4.3		3.9		3.6		3.3
Malaysia	314	3.1		2.8		2.6		2.3
Romania	202	2.0		1.8		1.7		1.5
Czech Rep	224	2.2		2.0		1.8		1.7
Hungary	175	1.7		1.6		1.4		1.3
Bulgaria	79	0.6		0.7		0.6		0.6
Zimbabwe	25	0.3		0.2		0.2		0.2

Source: CIA World Fact Book, 2006. Authors own calculations. GDP=Gross Domestic Product, PPP=Purchasing Power Parity.

[1] The 1993 economic consensus was the first to take place. See Holz (2006), and Wu (2006) for an overview and comparison of the 1993 and 2004 economic consensuses.

[2] Although economy-wide as well as sectoral nominal values were revised, real growth rates in some sectors remained unchanged.

[3] There are also problems related to financial services and real estate, i.e., the use of market value vs. book value.

[4] For the classical tradition, see also M. Abramovitz; and evolutionary economists such as R. Nelson, S. Winter, P. Saviotti, and J.L. Gaffard.

[5] It is important to note that the process of calculating PPP may not be ideal. Typical baskets of, for example, Chinese goods are heavily weighted towards food, low-cost clothing and other commodities, which are relatively cheap. This is rather different to a typical basket of U.S goods and services consisting of more expansive products, and even housing mortgages.