

Undervaluation of Imputed Rents in China's GDP Compared with Japan: a Historical Review of Estimation Methods and Relevant Statistics*

Dr. LI Jie¹

Abstract

This study compares the statistics on and methods used to estimate imputed rents in China and Japan over time. The comparison allows us to make the following two main findings. First, before China's first economic census in 2004, owner-occupied dwelling services as a proportion of GDP were seriously underestimated. Indeed, according to the official statistics, Japan's per capita value-added real estate amount in 2003 was 200 times more than that in China, while Japan's value-added real estate amount in 1994 (80% of which are owner-occupied dwelling services) was more than China's total GDP. Second, even after the economic census, the Chinese statistics are still highly likely to be underestimated. Such an underestimation results from the scarce data on value-added real estate (especially for the tertiary industry) including GDP on the production side and household final consumption expenditure including GDP on the expenditure side.

Keywords: China's GDP, SNA, Owner-occupied dwellings, Imputed rents, Value-added real estate

1. Introduction

Imputation is an important but also controversial concept in the national accounts. Household owner-occupied dwellings are the same as rental dwellings in that they pay rent on their own and these rents are also included in the accounts. Such rents are called imputed rents. They are not only a typical imputation to the SNA, they are almost the largest imputation as a proportion of GDP. Imputed rent is recorded on both sides, namely for the output of the real estate industry on the production side and for household final consumption expenditure on the expenditure side. After the first China economic census in 2004, the National Bureau of Statistics in China (NBS hereafter) reviewed and revised the methods used to estimate imputed rents. This revision led China's GDP from the real estate industry in 2003 to rise by 2.6 times, from 237.8 billion yuan (about 2% of GDP) to 617.3 billion yuan (about 4.5% of GDP).² At around the same time, the Economic and Social Research Institute in Japan (ESRI hereafter) also reviewed its methods of estimating imputed rents. However, the ESRI's revision resulted in Japan's GDP from the real estate industry in 2003 being revised downward by about 16%, from 69.15 trillion yen (about 14% of GDP, equating to 4942 billion yuan at the current exchange rate) to 59.64 trillion yen (about 12.2% of GDP, 4262 billion yuan). It was then revised further downward to 53.58 trillion yen in 2011.³ Even though China's population is about 10 times that of Japan, Japan's GDP for the real estate industry before the revision was about 20 times that of China. This discrepancy led academics and the media around the world, especially in Japan, to suggest that China's GDP statistics in this period were overestimated.⁴ Based on the foregoing, this study describes the historical background and estimation methods of imputed rents in Japan and China.

* **Acknowledgement:** This work was supported by the Grant-in-Aid for Scientific Research (C) of 2015 (Project Number 23530247). I would also like to thank Editage (www.editage.jp) for English language editing.

¹ Professor, Faculty of Economics, Saitama University, Japan, 338 8570. E-mail: lij@mail.saitama-u.ac.jp

² Data from the NBS China Statistical Yearbook, 2005 and 2007.

³ Data from the ESRI Annual Report on National Accounts, 2005, 2006, and 2014.

⁴ For example, see Rawski (2001), Balfour (2002), and Iwase (2002).

It also compares the relevant statistics of the two countries, finding the possibility that China's imputed rents were seriously underestimated until 2005 and are still being underestimated to some extent. The remainder of this paper comprises four sections. Section 2 refers to the SNA to describe why owner-occupied dwellings are included in GDP and how imputed rents should be estimated. Sections 3 and 4 examine the estimation methods used in Japan and China, respectively. Section 5 compares the Chinese and Japanese data to investigate the possible problems in China's GDP statistics. The final section concludes.

2. Treatment of Owner-Occupied Dwellings in the SNA⁵

2.1. Why Owner-Occupied Dwellings are Included in GDP

The production boundary in the SNA is defined by the "goods or services that are supplied to units other than their producers, or intended to be so supplied." However, "the production of housing services for their own final consumption by owner-occupiers has always been included within the production boundary in the national accounts, although it constitutes an exception to the general exclusion of own-account service production" (from the 1993 SNA, paragraph 6.29). The record of own-account service means adding the same amount to both the demand side and the supply side. However, this approach has been strongly criticized for its unsuitability for the measurement and analysis of market imbalance as well as for harming the understanding of economic trends. In response, the SNA states that "the ratio of owner-occupied to rented dwellings can vary significantly between countries and even over short periods of time within a single country, so that both international and inter temporal comparisons of the production and consumption of housing services could be distorted if no imputation were made for the value of own-account housing services" (from the 1993 SNA, paragraph 6.29). This statement clarifies that imputation for owner-occupied dwellings is essential for international comparisons and the analysis of GDP.

2.2. How Imputed Rents should be estimated

Since owner-occupied dwellings are not supplied to the market, there are no market prices. The following rental market approaches have thus been recommended for imputed rents: As well-organized markets for rented housing exist in most countries, the output of own-account housing services can be valued using the prices of the same kinds of services sold on the market in line with the general valuation rules adopted for goods or services produced on own account. In other words, the output of the housing services produced by owner-occupiers is valued at the estimated rental that a tenant would pay for the same accommodation, taking into account factors such as location, neighbourhood amenities, etc. as well as the size and quality of the dwelling itself. The same figure is recorded under household final consumption expenditures (from the 1993 SNA, paragraph 6.89). Indeed, not limited to owner-occupied dwellings, the basic conditions of market price approaches are that "goods or services of the same kind must actually be bought and sold in sufficient quantities on the market to enable reliable market prices to be calculated which can be used for valuation purposes" (from the 1993 SNA, paragraph 6.85). In addition, if the conditions are not met, a cost approach is recommended as the second best way: When reliable market prices cannot be obtained, a second best procedure must be used in which the value of the output of the goods or services produced for own use is deemed to be equal to the sum of their costs of production: that is, as the sum of: Intermediate consumption, Compensation of employees, Consumption of fixed capital, Other taxes (less subsidies) on production (from the 1993 SNA, paragraph 6.85). Although major countries including Japan have essentially adopted the former rental market approaches, China is still using the latter cost-based approaches.

3. Estimation of Imputed Rents in Japan

3.1. Japan's Estimation Method until 2005

Japan had long used a simple rental market approach until 2005.⁶ First, total rent across the country was determined by multiplying total floor area by the average rent of the country per square meter. The imputed rent of owner-occupied dwellings was then calculated by multiplying the total rent across the country by the ratio of owner-occupied dwellings in floor area. Arai (2005) pointed out the following concerns about using this estimation method. Since rental properties are mostly concentrated in urban area where rent is high, whereas homeownership is widely distributed where rent is low, using the average rent of the country uniformly means applying the expensive rent per unit of the cities to the wide homeownership of the regions, leading imputed rents to be overestimated.

⁵ Although the SNA has the latest version (2008 SNA), China and Japan still use the 1993 SNA as standard; therefore, I use the 1993 SNA. The presentation of aspects related to imputed rents in the 2008 SNA is substantially the same as the 1993 SNA.

⁶ For the accounting pre-revised estimation methods in Japan, see ESRI (2005) and Arai (2005).

3.2. Japan's Estimation Method after 2005

From 2005, the ESRI began to estimate imputed rent by using the average rent of each prefecture instead of the average rent of the country.⁷ As noted in the Introduction, this revision resulted in the GDP of the real estate industry in 2003 falling by about 16%. However, this change did not fully address the issue. As Arai (2005) stated, small-scale rental housing in the same prefecture is unevenly distributed across the prefectural capital. Hence, despite dividing by prefecture, the possibility of excessive estimates remains.⁸ In addition, the ESRI fragmented the estimation method in 2011, revising the GDP of the real estate industry further downward.

3.3. Comparison of Imputed Rents before and after 2005

Table 1 shows the difference in imputed rents before and after the change in estimation method.

Table 1: Comparison of the Imputed rent before and after 2005

Year	Imputed rent				Share of household final consumption expenditure (%)		Share of GDP* (%)		Exchange rate (yen/yuan)
	Pre-revised		Revised		Pre-revised	Revised	Pre-revised	Revised	
	(in billion yen)	(in 100 million yuan)	(in billion yen)	(in 100 million yuan)					
1980	15,903	1,192			12.2		6.6		133.4
1985	22,716	2,830			13.1		7.0		80.3
1990	32,401	10,768			14.0		7.4		30.1
1995	43,785	39,067	36,623	32,677	16.1	13.7	8.8	7.4	11.2
2000	49,910	38,363	42,776	32,879	17.8	15.5	9.8	8.5	13.0
2003	52,719	37,676	44,753	31,983	19.1	16.3	10.6	9.2	14.0
2010			46,729	36,039		17.0		9.8	13.0
2013			46,562	29,560		16.4		9.8	15.8

Sources: Pre-revised amounts based on *the Annual Report on National Accounts (2005)*, ESRI; Revised amounts based on *the Annual Report on National Accounts (2015)*, ESRI.

Note: To ensure comparability with the revised GDP, FISIM is excluded here.

This table shows that before the revision, imputed rent increased by 3.3 times from 15.9 trillion yen in 1980 to 52.7 trillion yen in 2003. According to the Japan Statistical Office's Housing and Land Survey report, the number of owner-occupied dwellings only slightly increased from 21,650 in 1983 to 28,666 in 2003.⁹ This fact suggests that as area size increases, the contribution of the estimated rent rises. Further, the proportion of household final consumption expenditure increased from 12.2% in 1980 to 19.1% in 2003, while that of GDP rose from 6.6% in 1980 to 10.6% of 2003. In summary, a significant downward revision was noted in all years. In 2003, imputed rent was revised downward by 15% from 52.7 trillion yen to 44.8 trillion yen, while the proportion of household final consumption expenditure fell by 16.3% and that of GDP dropped by 9.2%.

4. Estimation of Imputed Rents in China

4.1. Introduction of the SNA in China and Upward Adjustment by the World Bank

The national income statistics provided by the MPS system (System of Material Product Balances) in the planned economy period in China are well known. Since the economic reform, however, because services have grown rapidly, the NBS has launched a study of GDP, which has been central to the SNA system since the early 1980s. To overcome the shortcomings of the MPS system (e.g. not covering the production activities of non-physical services), the NBS began to estimate GDP as an index in 1985. In 1993, it then abolished estimates based on the MPS system and moved to the SNA system. This action was influenced by the external changes in the early 1990s in the former Soviet Union and in Eastern European countries that no longer conformed to the MPS system as well as the internal changes made at the 14th Party Congress, which set the introduction of market mechanisms as the reform target for China's economic system.

⁷For the accounting revised estimation methods in Japan, see ESRI(2007).

⁸See Arai(2005).

⁹See Japan Statistical Office, Housing and Land Survey report, 1983–2003.

The World Bank report in 1991 declared that there were shortcomings in the fundamental concepts, survey scope, and survey methods of the provision of the SNA in China.¹⁰ Specifically, the fundamental concept was deeply rooted in the MPS, the survey scope still focused on material production, and the survey method was a traditional administrative production reporting approach. In addition, the price system still showed many of the characteristics of a planned economy and the prices of many products remained under the government's control. All these factors led to the underestimation of GDP and the overestimation of economic growth in China. Based on this report, the World Bank upwardly adjusted its 1992 GDP figure for China by more than 30%.¹¹ This upward adjustment continued until 1998. In 1999, China's Ministry of Finance and the NBS submitted a request to cancel this ongoing adjustment to China's GDP statistics. The NBS successfully rebutted each adjustment item made by the World Bank, except the underestimation of housing services.¹² Xu subsequently confirmed the possibility of housing services being underestimated in China's GDP.¹³

4.2. Estimation of Imputed Rents in China

The first economic census of all economic activities in the secondary and tertiary industries was performed in 2004. After the census, the NBS revised China GDP accounts significantly. This revision included not only the sources of information, but also the scope of accounting approaches and the estimation methods used, including that to calculate owner-occupied dwellings. However, cost approaches that are equal only to the imputed depletion amount (= owner-occupied housing estimated amount \times depreciation rate) are still being used to estimate the imputed rent in urban and rural areas. While the estimated amount of owner-occupied housing had been calculated at historical cost prices before the census, it became based on current prices thereafter.¹⁴ This led the urban and rural depreciation rates to be revised from 4% to 2% and from 2% to 3%, respectively.¹⁵ Moreover, while rental market approaches are actually implicit in the cost of land rent, the cost approaches used in China do not take this element into consideration and the depreciation rate is too low to be discussed further. Because the NBS did not publish the added value of owner-occupied dwellings before the first economic census, Table 2 shows the added value of the whole real estate industry including owner-occupied dwellings as well as the share of GDP in China and Japan. It shows that the pre-revised real estate value added in China increased significantly from 1990 to 2003, but the highest share of GDP was only 2%, which was very low. Compared with the same period, the Japanese data are minimal: Japan's real estate value added in 1994 was 57 times that in China, even more than China's total GDP in the same period.

Table 2: Comparison of the pre-revised real estate value added amounts for China and Japan

Year	Pre-revised real estate value added (in 100 million yuan)			Share of GDP(%)		Exchange rate (yen/yuan)
	a. China	b. Japan	b/a	China	Japan	
1990	325	15,542	47.8	1.8	10.7	30.1
1991	368	19,673	53.4	1.7	10.6	25.3
1992	521	23,143	44.4	2.0	11.0	22.9
1993	641	29,481	46.0	1.8	11.7	19.2
1994	870	49,597	57.0	1.9	12.1	11.9
1995	1,059	53,298	50.3	1.8	12.1	11.2
1996	1,149	46,918	40.8	1.7	12.1	13.1
1997	1,259	43,352	34.4	1.7	12.2	14.6
1998	1,453	40,695	28.0	1.9	12.5	15.8
1999	1,528	47,500	31.1	1.9	12.9	13.7
2000	1,690	50,993	30.2	1.9	13.1	13.0
2001	1,885	45,872	24.3	1.9	13.5	14.7
2002	2,098	45,305	21.6	2.0	13.9	15.1
2003	2,378	49,420	20.8	2.0	14.0	14.0

Sources: The pre-revised amounts for China are based on the *China Statistical Yearbook (1998–2005)*, NBS. The pre-revised amounts for Japan are based on the *Annual Report on National Accounts (2005)*, ESRI.

¹⁰ See World Bank (1991).

¹¹ See World Bank (1993).

¹² See Xu(1999).

¹³ See Xu(2004).

¹⁴ See Xu(2006).

¹⁵ For the estimation method in China before the first economic census, see Xu(2006); for after the census, see NBS (2007).

After the first economic census, the NBS released an upward revision of the country's 2004 GDP statistics to 16.8%, 92.6% of which was due to the increase in tertiary industry GDP in December 2005. The proportion of the real estate value added was also revised upward markedly, from 2% of GDP to 4.5%. The NBS further released the only imputed added value figures for owner-occupied dwellings, as shown in Table 3, which accounted for nearly 60% of the real estate value added.

Table 3: China's revised added value of owner-occupied dwellings in 2004

	Value added (in 100 million yuan)	Share of GDP (%)
Tertiary industry	64,561	40.4
Real estate	7,174	4.5
Owner-occupied dwellings	4,061	2.5

Sources: Based on the *China Statistical Yearbook (2006)*, NBS.

The SNA concept originated in developed economies that are characterized by well-organized markets for rented housing. However, such well-organized markets for rented housing did not exist in China in the late 1980s when the NBS introduced the SNA. Yet, while under the original historical conditions, it was actually appropriate for the NBS not to use the rental market approaches recommended by the SNA, this might no longer be the case.

5. Comparison of Owner-Occupied Dwellings in China and Japan

5.1. Comparison from the Production Side

Since China and Japan have not systematically published the imputed added value of owner-occupied dwellings, the comparison presented in Table 4 is based on the added value of the whole real estate industry, including owner-occupied dwellings.

Table 4: Comparison of the revised real estate value added for China and Japan

Year	Revised GDP (in 10 billion yuan)			Revised real estate value added (in 100 million yuan)			Share of GDP(%)		Exchange rate(yen/yuan)
	a. China	b. Japan	b/a	a. China	b. Japan	b/a	China	Japan	
1980	45	183	4.0	96	1,635	17.0	2.1	8.9	133.4
1985	90	404	4.5	215	3,828	17.8	2.4	9.5	80.3
1990	187	1,460	7.8	662	14,307	21.6	3.5	9.8	30.1
1995	608	4,378	7.2	2,354	47,965	20.4	3.9	11.0	11.2
2000	992	3,846	3.9	4,149	44,477	10.7	4.2	11.6	13.0
2005	1,849	3,743	2.0	8,516	40,252	4.7	4.6	10.8	13.4
2010	4,015	3,710	0.9	22,782	43,876	1.9	5.7	11.8	13.0
2013	5,688	3,049	0.5	33,295	35,667	1.1	5.9	11.7	15.8

Sources: The revised figures for China are based on the *China Statistical Yearbook (2014)*, NBS. The revised figures for Japan are based on the *Annual Report on National Accounts (2011 and 2015)*, ESRI.

The real estate industry in Japan consists of rented housing, accounting for 87.7% of the market in 2013, and other real estate. Although the share of rental housing value added in the real estate industry is close to 90% that of owner-occupied dwellings by area is about 80%. Hence, it can be speculated that Japan's share of the imputed added value of owner-occupied dwellings in real estate added value is about 70%, which is much higher than the 56.6% of China, as shown in Table 3. China's revised real estate added value has doubled each year compared with the pre-revised amounts shown in Table 2. By contrast, Japan's revised total has lowered each year compared with the pre-revised figures. In the 1980 and 1990s, Japan's GDP was 4 to 7.8 times that of China, while the real estate added value in Japan was about 20 times that of China. After 2000, the GDP gap between China and Japan rapidly closed, and China's GDP surpassed Japan in 2010. Nevertheless, the real estate value added remained about half that of Japan. Indeed, by 2013 China's GDP was nearly twice that of Japan, whereas the real estate value added was still lower than that in Japan.

Moreover, by share of GDP, Japan's real estate added value increased from 8.9% in 1980 to 11.7% in 2013; by contrast, China's share was only around 2% in the 1980s, 3% in the 1990s, 4% in the 2000s, and 5% after 2010. By way of another comparison, according to the earliest data released by the Japanese government, the real estate added value share of GDP as early as 1955 was already 5.4%, rising to 7.4% in 1960 and 7.8% in 1970.¹⁶ Hence, the share of GDP in 2013 in China (5.9%) was only equivalent to 1956 in Japan before the high growth period began. These data show that the pre-revised underestimation was serious, even though the revised figures may also have been underestimated. Indeed, the underestimation of real estate added value may have caused an overall underestimation in the tertiary industry. Table 5 shows the added value and the number of employed persons in China and Japan. China's tertiary industry in the 1990s was less than one-tenth of that in Japan, while in 2013—when its GDP was nearly twice that in Japan—the tertiary industry was barely more than that in Japan. The share of GDP shows a more serious issue. In 2013, the tertiary industry share of GDP in Japan was 72.8% compared with 46.1% in China. According to the Petty–Clark law, in 2013 China's industrial structure was not only lower than that in Japan in 1980 (57.7%), it was only slightly higher than that in Japan in 1950 (45.2%).¹⁷ Such figures are hard to believe. In addition, the comparison of the persons employed in the tertiary industry in China and Japan shows the contradiction in the figures, namely a sharp rise in the employed persons in the tertiary industry in China, which was 6.7 times that of Japan in 2013. Therefore, the Chinese tertiary industry as a whole may be underestimated.

Table 5: Tertiary industry and number of employed persons in China and Japan

Year	Tertiary industry (in 10 billion yuan)			Share of GDP (%)		Number of employed persons (10,000 persons)		
	a. China	b. Japan	b/a	China	Japan	a. China	b. Japan	a/b
1980	10	103	10.5	21.6	57.7	5,532	3,020	1.8
1985	26	232	9.0	28.7	59.0	8,359	3,283	2.5
1990	59	849	14.4	31.5	59.8	11,979	3,669	3.3
1995	200	2,780	13.9	32.9	65.2	16,880	3,940	4.3
2000	387	2,527	6.5	39.0	67.2	19,823	4,103	4.8
2005	749	2,649	3.5	40.5	70.6	23,439	4,285	5.5
2010	1,739	2,655	1.5	43.1	71.4	26,332	4,395	6.0
2013	2,622	2,219	0.8	46.1	72.8	29,636	4,445	6.7

Sources: Number of employed persons in China based on the *China Statistical Yearbook (2014)*, NBS. Number of employed persons in Japan based on the *Labour Force Survey*, Statistics Bureau, Ministry of Internal Affairs and Communications.

5.2. Comparison from the Expenditure Side

Japan's GDP calculation is based on the expenditure approach, under which detailed information on items are published, including expenditure on imputed rents. However, few items are published in China. After the first economic census, the NBS revised its historical data and began to publish household consumption data; however, it stopped such reporting in 2013. Table 6 compares overall household consumption expenditure with household consumption expenditure on housing, electricity, gas, and water supply for China and Japan.

¹⁶ Early Japanese data from ESRI (2001).

¹⁷ The data on Japan in 1950 are from ESRI (1953).

Table 6: Household consumption expenditure in GDP in China and Japan

Year	Household consumption expenditure					Household consumption on housing, electricity, gas, and water supply				
	Level (in 10 billion yuan)			Share of GDP (%)		Level (in 10 billion yuan)			Share of GDP (%)	
	a. China	b. Japan	b/a	China	Japan	a. China	b. Japan	b/a	China	Japan
1980	23	98	4.2	50.8	53.7		19			10.3
1985	47	217	4.6	51.6	53.5		42			10.4
1990	95	768	8.1	48.8	52.2		146			9.9
1995	284	2,390	8.4	44.9	54.1		507			11.5
2000	459	2,132	4.6	46.4	55.1		496			12.8
2004	652	2,117	3.2	40.5	56	96	520	5.4	6	13.8
2005	730	2,075	2.8	38.9	56.4	111	516	4.6	5.9	14
2006	826	1,923	2.3	37.1	56.5	146	478	3.3	6.6	14.1
2007	963	1,820	1.9	36.1	55.9	167	457	2.7	6.3	14
2008	1,117	1,894	1.7	35.3	57	192	476	2.5	6.1	14.3
2009	1,236	1,985	1.6	35.4	58.7	207	511	2.5	5.9	15.1
2010	1,408	2,126	1.5	34.9	57.9	242	545	2.2	6	14.8
2011	1,649	2,222	1.3	35.4	59	274	570	2.1	5.9	15.1

Sources: Household consumption on housing in China data are based on the *China Statistical Yearbook (2010--2012)*, NBS. The data in Japan are based on the *Annual Report on National Accounts (2013)*, ESRI.

Note: This comparison ends in 2011, after which point the *China Statistical Yearbook (2013)* stopped reporting household consumption.

Table 6 shows that although China's population is about 10 times that of Japan, its total household consumption expenditure is far lower. Indeed, in the 1990s, this represented only one-eighth of that of Japan, while by 2011, although China's GDP had surpassed that of Japan, its household consumption expenditure was still far lower. The share of GDP shows a continued upward trend in Japan, now standing at nearly 60% of household consumption expenditure in GDP, demonstrating that economic growth depends on household consumption expenditure. By contrast, although this share in China in 1980 accounted for 51%, similar to that in Japan, it continued to decline, falling to 35% in 2011. This finding may confirm that China's economic growth since 2000 has not been primarily dependent on consumption, but rather on foreign demand and domestic investment demand. Alternatively, it may be related to the low estimate of services consumption.

Japan's share of imputed rents in household consumption on housing is about 66–67%, but China's share is unknown. In Japan, the share of household consumption on housing in GDP has increased year by year, rising above 15% in 2011, while that of China has been hovering around 6%. China's share was less than one-fifth of that of Japan in 2004, and it remained less than half in 2011. However, total consumption is closely related to this number. Table 7 compares per capita GDP, household consumption on housing, and the floor space of residential buildings for China and Japan. For the same reason as in Table 6, the comparison also runs until 2011.

Table 7: Per capita household consumption on housing and floor space of residential buildings

Year	Per capita GDP (yuan)			Per capita household consumption on housing (yuan)			Per capita floor space of residential buildings(sq. m)		
	a. China	b. Japan	b/a	a. China	b. Japan	b/a	China's urban	China's rural	Japan
1980	465	15,547	33.4		1,609			9.4	
1983	603	20,744	34.4		2,240				27.8
1988	1,386	91,473	66.0		9,199			16.6	30.6
1993	3,117	203,564	65.3		21,902			20.7	33.8
1998	6,936	255,618	36.9		31,426			23.3	36.8
2002	9,379	255,229	27.2		34,649		24.5	26.5	
2003	10,572	275,009	26.0		37,690		25.3	27.2	40.1
2004	12,382	295,675	23.9	738	40,666	55.1	26.4	27.9	
2005	14,334	287,683	20.1	851	40,390	47.5	27.8	29.7	
2006	16,943	266,168	15.7	1,113	37,398	33.6	28.5	30.7	
2007	20,177	254,139	12.6	1,266	35,686	28.2	30.1	31.6	
2008	23,793	259,479	10.9	1,445	37,176	25.7	30.6	32.4	42.5
2009	26,135	264,082	10.1	1,554	39,875	25.7	31.3	33.6	
2010	30,041	286,854	9.5	1,806	42,529	23.6	31.6	34.1	
2011	34,566	294,444	8.5	2,033	44,585	21.9	32.7	36.2	

Sources: The data for the floor space of residential buildings in China are based on the "10-35 Floor Space of Newly Built Residential Buildings and Housing Conditions of Urban and Rural Residents" report from the *China Statistical Yearbook (2012)*, NBS. The data in Japan are based on *The Housing and Land Survey* (=Average floor space per dwelling × Number of dwellings / Number of household persons), Statistics Bureau, Ministry of Internal Affairs and Communications.

Although China's GDP in 2010 surpassed that of Japan, Japan is still nearly 10 times that of China in terms of per capita GDP. The gap in per capita consumption for China and Japan is much larger still: in 2004, China's household consumption on housing including imputed rents per capita was only 738 yuan, while that in Japan was 55 times larger (40,666 yuan). By 2011, this gap had fallen but only to 22 times the size. Is the huge gap in per capita consumption on housing related to livable floor area? In 2008, Japan's per capita floor space of residential buildings was 42.5 sq. m, 1.35 times China's urban and rural average, while per capita expenditure on housing in Japan was 25.7 times greater than that in China. In other words, Japanese consumption expenditure per square meter is nearly 19 times that of China. While Japan's housing quality may be higher than that in China, even such a quality factor cannot explain this large gap. In summary, all these comparisons show that China's GDP accounts on imputed rents may be underestimated, while they do not rule out that Japan may also have overestimated imputed rents.

6. Conclusion

This study surveys the methods used to estimate imputed rents in China and Japan and compares the statistics derived from the production side and the expenditure side of GDP. Its findings show that while Japan lowered its imputed rent estimates twice, China's figure greatly increased after the first economic census. However, even from the revised data, the Chinese estimates of housing services are likely to remain low. The lack of a mature market for rented housing and no suitable rental market can be reasons for this conclusion. Further, the NBS has not introduced rental market approaches, but rather continued to use cost-based approaches, which may also explain the low estimate. Along with the development of China's markets for rented housing, if the NBS adopted rental market approaches, the estimates of real estate value added and consumption expenditure on housing may further increase. Then, the Japanese sub-regional accounting approach to imputed rent introduced in 2005 to integrate national and regional accounts might become a reference for China's adoption of rental market approaches.

7. References

- Arai, H. (2005) About Imputed Rent Estimate of Owned Houses in National Accounts. ESRI Discussion Paper Series, No. 141 (in Japanese)
- Balfour, F. (2002) How Much is China Cooking its Numbers? *Business Week, Asian Edition*, April 8, 2002.
- ESRI Annual Report on National Accounts, 1999–2015.
- ESRI (1953) National Income Explanatory Material No. 1 After the War of National Income—The Level and Structure The first draft 1953
http://www.esri.cao.go.jp/jp/sna/data/data_list/kakuhou/files/rekishi/pdf/2800_1.pdf (in Japanese).
- ESRI (2001) National Accounts Report for Long-term Main Series 1955~1998, Provincial Finance Printing Office (in Japanese).
- ESRI (2005) For Estimation of “Owned Houses of Imputed Rent” in the SNA, National Accounts Study Meeting 6th reference revision issues exploratory committee.
http://www.esri.cao.go.jp/jp/sna/seibi/kaigi/shiryoku/kijungizi_050225.html (in Japanese).
- ESRI (2007) SNA Estimation Method Manual (2007 revised edition),
http://www.esri.cao.go.jp/jp/sna/data/reference1/h12/sna_kaisetsu.html (in Japanese).
- Iwase, A. (2002) Full of Lies of 7 Percent Economic Growth. *Bungeishunju*, August 2002 (in Japanese).
- Japan Statistical Office, Housing and Land Survey report, 1983–2003.
- NBS China Statistical Yearbook, 1998–2014.
- NBS (2007) China Economic Census Annual GDP Calculation Methods, China Statistics Press (in Chinese).
- Rawski, T.G. (2001) What is Happening to China's GDP Statistics? *China Economic Review*, 12, 347-354.
- United Nations et al. System of National Accounts 1993 <http://unstats.un.org/unsd/nationalaccount/sna1993.asp>.
- World Bank (1991) China: Statistical System in Transition, Document of the World Bank, No. 9557-CHA, Washington, D.C.
- World Bank (1993) China's GDP Per Capita. Document of the World Bank, No. 13580-CHA, Washington, D.C.
- Xu, X. (1999) Evaluation and Adjustments of China's Official GDP by the World Bank and Prof. Maddison. *Journal of Econometric Study of Northeast Asia*, Vol.1, No.2.
- Xu, X. (2004) A Study on Accounting of China's Service Industry and Existing Problems. *Journal of Econometric Study*, 2004, No.1 (in Chinese).
- Xu, X. (2006) GDP Accounting Changes in Economic Census Year. *Journal of Econometric Study*, 2006, No.3 (in Chinese).