What Can Be Learned About the Economies of China and India from the Results of Purchasing Power Comparisons?

Alan Heston[1]

Introduction

Comparisons of India and China have been a media and scholarly staple since 1950 with academic antecedents in the Orientalist tradition and more popular precursors in accounts of famine, floods and disease. Since 1950 there have been ecnomic comparisons by Wilfred Malenbaum, T.N. Srinivasan, S. Swamy, and A.K. Sen among others. Scholars, whose principal interest was China, have been wiser, perhaps, in concentrating their attention on the Chinese experience, rather than in comparisons. My research interests for the past 40 years have concentrated on purchasing power estimates across regions and countries, so not surprisingly, this paper adopts a comparative framework.

Part I of the paper discusses the inter-relationships of purchasing power conversions of GDP to economic growth. Part II looks at both China and India in the 2005 round of the UN International Comparison Programme (ICP) that is being coordinated by the World Bank, the Regional Banks and Economic Commissions.[2] The 2005 ICP round provides estimates of purchasing power parities (PPPs) of currencies and real product per capita for 150 countries, and the results for China and India are discussed in the context of the size of these economies. Part III discusses possible insights that the ICP provides into the sources of past and prospects of future economic growth in China and India. Part IV concludes with a note on PPPs and the 'appropriate' the exchange rate, the subject in the past several years of a number of writings involving both analysis, policy recommendations for China and likely scenarios in the future.

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[1] University of Pennsylvania.
[2] The first round of the ICP was initiated in 1968, when the author joined the work, and involved 10 countries, including India, for 1970. The 2005 round involves 144 countries including all-India and a less satisfactory estimate for all of China. See:
http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/ICPEXT/0,,pagePK:62002243~theSitePK:270065,00.html

Part I: The Growth Record in a Comparative Framework

Most discussions of growth rates consider in their comparisons only the national statistical record without taking account the levels of economic output at the beginning and end of the growth journey for the countries being compared. Consider for example, the following illustration from the Penn World Table (PWT), which has attempted to monitor the performance of China and India along with most of the worlds' economies. The distinctive feature of PWT has been to use purchasing power parities to move from GDP and its major components at national currencies to a common international unit that we have termed international dollars; and to provide a time series of these estimates. In the latest version, PWT 6.2 the estimates run for some or all the years, 1950 to 2004, for some 168 countries.[3] This version, which is under revision, incorporates the 2006 official revisions of China's national accounts based upon new service sector surveys and Chinese official growth rates. Table 1 presents the per capita GDP of China and India in 1978 and 2000 in 2000 dollars converted at PPPs in columns 1 and 2. Columns 3 and 4 express these relative to the United States. If taken individually the economic performance of each country over this period might not raise any eyebrows. But compared to India in particular the estimates become implausible moving backward from 2000 (Column 5): in 1952 using official growth rates of both countries, an admittedly questionable excursion, India is 2.43 times China's per capita GDP.

Table 1: Per Capita GDP Levels at 2000 Prices from PWT 6.2

Year	GDP pc		As % of US		Ratio
	China	India	China	India	India/China
	(1)	(2)	(3)	(4)	(5)
2000	$ 4970	$ 2990	14.3%	8.6%	0.60
1978	$ 669	$ 1318	3.2%	6.0%	1.97
1952	$ 326	$ 794	2.7%	6.3%	2.43

Scholars such as Eckstein, Malenbaum, Swamy, Clark, and others who have looked at both countries over the past 50 years, might have given India a slight edge in 1952 as China emerged from civil war to a frosty international reception, while India had

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[3] See pwt.econ.upenn.edu.

gained its independence, written its constitution and launched its First 5 year plan with international assistance. However, despite the ups and downs of China until 1978, based on a variety of real measures like caloric consumption, energy consumption, primary education and health status, observers would put China above India at the start of reforms in 1978. Further, there are purchasing power studies around the beginning of reforms in China that clearly put Chinese per capita GDP above India by 20 to 50 percent.[4] Clearly official growth rates for both countries do not describe their comparative experience within acceptable margins, and may not be a very good starting point for understanding their growth experience or the lessons they provide for other countries.

What is the Explanation?

Most literature puts the blame on China's official growth rates. However, the discussion often gets complicated.[5] For example, it is frequently argued that if anything, China has underestimated its GDP, so how can it have over-stated its growth rates? The answer, in fact, is that the two phenomena are quite compatible.[6] Critics of Chinese growth rates have argued that the Chinese price statistics have underestimated the degree of inflation while defenders (Klein and Ozmucur, 2003) have pointed out that China has not made corrections for quality improvements, so in fact price indexes have a tendency to over-state inflation.

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[4] Eckstein (1977) put Indian per capita GDP in 1952 at $50 and that of China at $60. Hollister (1958) undertook a bi-lateral PPP comparison of China and the U.S, for 1952 and 1955, placing China at $146 in 1955. In PWT, India was $145 in 1955, both in current prices. The closeness of these 2 numbers is totally by chance, but certainly places China's position relative to India as very similar. Kravis (1984) carried out China-US PPP comparison that put per capita GDP at 12% of the US in 1975, and that of India, 6%, again very different from the what is implied by official growth rates going back from 2000. Ahmad (1983) carried out a PPP study for 1981 that also included India. It impied that in 1981 China's per capita GDP was 50% above that of India. The study used by Maddison (1998) in his work on China is based on Ren Ruoen and Chen Kai (1995), that less so than Kravis, suggests China's economic position was higher than implied by official growth rates.

5 The discussion here focuses on growth rates, but there has also been a fairly heated discussion between Carsten Holtz and Angus Maddison regarding the latter's adjustments to levels of Chinese GDP.

[6] Many adjustments that raise the level of GDP or major components are done once only, but many require substantial adjustments in earlier years too. Suppose older series put GDP at 50 in 1990 and 100 in 2005, with the service sector being 15 and 30 respectively. A new survey raises the service sector to 50 and GDP to 120 in 2005, and to 30 and 65 in 1990. The old growth showed a doubling (100/50) of output the 15 years, and the new growth rate, an 85% increase. (120/65 – 1)*100, This amounts to a slower growth than before correcting for undercounting of the level of services in GDP.

The recent paper by Harry Wu (2007) has focused on the official incorporation by China of their 2006 revisions of national accounts and he proposes a more plausible explanation. In the official revisions the current price statistics were adjusted upwards to reflect previously unrecorded output, particularly in the service sector. This was followed by a constant price series that is the basis for the estimation of growth rates of GDP. What Wu shows is that the official growth rates were maintained throughout the 1990-2005 period, while the current price production statistics showed some decline in the 1997-98 period in response to the Asian financial crisis. The only way to achieve the planned growth rates was to adjust the deflators of GDP downward in an inexplicable and undocumented way, so as to preserve the planned level of growth.

Put another way, in OECD countries and most countries including India that have followed the UN System of National Accounts over the past 40 years, real GDP growth series is derived from independent estimates of current production and price deflators, and so the rate of growth is a residual. What Wu is arguing is that in China, current production and planned growth rates are taken as truth, and the GDP deflator is residually derived.[7] In contrast to China, Indian planning shortfalls have historically been freely reported with the opposition blaming policies of the current government, and with the current government blaming external factors, like the monsoon. None of this necessarily puts into question the increasingly accepted view that China is now the second largest economy in the world. However, this discussion of growth rates is intended to question some of the projections of growth for China into the future for two reasons, one because of likely overstatement, and two because of structural factors to be discussed in Part III.

Maddison and Wu (2007) have suggested lower growth rates than official rates, namely 7.85% p.a. versus 9.6% for total GDP. This growth restatement is based primarily on adjustments to the official rates for industrial production and services. Table 2 presents in column (1) the official levels of GDP per capita for China where the value in 2003 is set as an index of 100; columns (2)-(4) do the same for the Maddisson and Wu

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[7] China derives its constant price series from the production side of the accounts which means that there are different deflators for the major sectors like agriculture, industry, services and the like. The implication of Wu's analysis is that the deflators of some of these sectors take up the slack. Part III discusses the likely case that deflation of the tertiary sector is a suspect and the implication this has for understanding future growth prospects in both China and India .

estimates (MW) and the PWT estimates for China and India. Column (1) suggests that per capita GDP in constant prices was 6.9% in 1952 and only 13.6% of 2003 per capita GDP levels at the start of reforms.[8]

Table 2. Official, MW, and PWT Indexes of Per Capita GDP

Year	Official	Maddison & Wu	PWT62		Ratio Maddison & Wu	Ratio PWT62
	China	China	China	India	India/China	India/China
	(1)	(2)	(3)	(4)	(5)	(6)
1952	6.9	11.2	6.6	26.5	1.00	2.43
1978	13.6	20.4	13.5	44.1	0.91	1.97
1990	31.7	39.0	33.6	63.5	0.69	1.13
2003	100.0	100.0	100.0	100.0	0.42	0.60

The adjustments proposed by Maddison and Wu are incorporated in column (2). Column (3) is close to, but not identical to the official series in column (1); the difference arises because PWT is based on the growth rates of the four expenditure components, consumption, investment, government and the net foreign balance, which uses slightly different weights than contained in the official statistics.[9]

Column (5) asks the following question? If India and China had equal per capita GDPs in 1952, what would be the relationship of India to China in subsequent years assuming the PWT values for India and the adjustments of Maddison and Wu for China? So in column (5) for 1952 the ratio of GDP per capita of India to China is taken as 1.00 Even though China experienced much larger swings during the Great Leap and Cultural Revolution the experience of China and India over the whole period 1952 to 1978 was fairly similar, namely slow growth. In the column (5) scenario, China pulled

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[8] Official Chinese statistics present a time series of national accounts beginning in 1978. However the State Statistical Bureau and the Hitotsubashi University (1997) put the national accounts of China in the form of the UN system of national accounts (SNA) from 1952 to 1978. These estimates were based on the older national accounts of China that used the Material Product System of national accounts used in Soviet-bloc countries.

[9] The relation of the indexes of India to China may appear larger in Table 2 (Column 4 to 3) than in Table 1; this is because in Table 2, 2003 is set at 100 for both countries. Because the level of per capita GDP in China is much larger than India in 2003, it is not really appropriate to compare the two indexes.

significantly ahead of India after the reforms began in 1978 reaching a per capita GDP in 2003 that was more than double that of India.

      Column (6) is simply a restatement of the last column of Table 1, filling in the rows of Table 2 for years in addition to 1978 that are used by Maddison and Wu. As noted, column (6) relies on official series in China and India, using PPPs for GDP that are somewhat different than those of Maddison and Wu to obtain the starting levels of GDP per capita. The conclusion is that the growth rates of China implicit in column (5) provide us with a much more plausible comparison of the economic performance of China and India than provided by column 6.[10]

      The discussion of growth rates so far has focused on consistency over the past 30 to 55 years. But our conclusion clearly has implications for projections that are based upon past growth rates. For example, the Economist (June, 30, 2007, p.31) presents a Goldman Sachs GDP forecast, beginning at a lower base than PWT, that puts the total size of the Chinese economy as passing the United States 2025, when both would have $20 trillion in 2006 prices. Such forecasts are based on past official growth rates, which if overstated, bring into question the value of such projections. There are other reasons that past growth, at official or other rates, may not be a guide to future experience, which are taken up on Part III.

Part II: Levels of GDP in China and India

      China and India have been leaders in advocating that their votes in the IMF should be based upon their GDP converted at PPPs; while at the same time maintaining that the United Nations should continue the use of exchange rates for determining their contributions. This is hardly surprising since votes in the UN are primarily by membership and in the World Bank and IMF by size of the economy. Compared to exchange rates, the use of PPPs would in 2003 in PWT raise China's GDP by a factor of 4.2 and India's by 5.7 relative to the United States.

      Another way to express this relationship is the national price level, the PPP/Exchange Rate expressed as a percentage. In 2003 these estimates in PWT were

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[10] In PWT 6.3 it is proposed to provide series for China using both sets of growth rates.

17.5 in India and 23.9 in China, meaning it would take $ 0.175 in India and $ 0.239 in China to purchase what a dollar would buy in the United States over the bundle of goods that make up GDP. The fact that non-tradable goods like construction, education, personal services and general government comprise over half of GDP helps make such differences easier to comprehend. The PWT estimates of PPPs for China and India are approximately the same as those used in the World Bank and in the IMF for its World Economic Outlook. One point that emerges is that China's price level is not different from that of countries at similar levels of income, a point not usually made clear in the discussions of whether the exchange rate of China is undervalued.

More Recent PPP Estimates

The price levels quoted above are at the lower end of the spectrum of estimates that have been put forward in recent years for China and India. That is, they place the GDP of these countries higher than others who on plausible grounds argue for numbers that are often 2/3 or half of that in PWT or the World Bank. The good news is that the 2005 ICP estimates include both China and India as participants so that new information will soon be available. The first release of these data is scheduled for December, 2007 after the deadline for the written version of this paper. However, several characteristics of the 2005 round can be described at this time.

India participated in the first round of the ICP covering 10 countries for 1970 (Kravis, Kennessey, Heston and Summers, 1975), and like a number of other countries, has had a love-hate relationship with the project over the years. In contrast, China has never fully participated in the ICP, which has given rise to what might be termed partial surveys (see footnote 3). Full participation requires that a country provide a detailed distribution of expenditures for about 150 basic headings like rice, public transport and residential construction. For each heading countries must also provide national annual average prices of 3-6 product specifications per heading. This price collection is the truly international characteristic of the work that permits estimation of PPPs at both detailed and aggregate levels.

China agreed to participate in the ICP in the 1993 and 2005 comparisons but on a limited level, namely based on urban prices. In 1993 the plan was to compare Shanghai

with Tokyo and Guangdong with Hong Kong; the Shanghai comparison was never made public but the Guangdong was completed and was described in the publication of ESCAP(1999). Of course, that leaves the question of how you go from Guangdong to all of China, and in the ESCAP publication, this was not attempted. Interestingly there is a long tradition of such city-to-city comparisons going back to a Shanghai-Tokyo comparison for 1955.[11]

The price collection by China in 2005 took place in 11 cities and their surrounding areas. The expenditures refer to all of China and the prices are being moved to an all-China basis to replicate the inputs of fully participating countries. Like the 1993 comparison, the relationship of urban to rural prices is the critical step. There have been no official studies of rural-urban price differences. There are urban and rural expenditure surveys that permit comparisons of unit values of many food items and several non-food items like tobacco, fuels and power, and transport. Some research has been carried out with these expenditure surveys but permission to make any results of these studies public has not been forthcoming. Further, even if these results were available, the consumption items for which price differences appear largest are items like housing, medical, and personal services.[12] These are precisely the items that most studies have not been able to measure very well.

In the context of poverty analysis, Ravillion and Chen (2007) have examined the differential increases in prices in urban and rural households but not the level of prices. Brandt and Holz (2006) have made the most comprehensive set of comparisons of rural-urban and regional price levels in China for 1990 updating the results to 2004.[13]   As more and more of the urban housing is market priced, the rural-urban differentials for rented and owner-occupied housing have increased in China. However, in their work Brandt and Holz only approximate rental differences by the cost of construction taking no account of the scarcity value of land. If there is a direction of error in their estimates, it is

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[11] See Mizoguchi (1968). This study found that the urban price level in Japan was about 30% higher than in China. The study was also consistent with Colin Clark's estimates in Clark (1965, 1976)

[12] For example, Aten (2007) shows that for the United States, prices of commodities increase only slightly as you move from low income small urban areas to higher income centers like New York or San Francisco, whereas service prices rise fairly sharply. Overall prices differ by over 60% across the 38 BLS centers that are surveyed.

[13] The Brandt-Holz estimates have been used by Sicular, et.al. (2007) to compare the rural-urban income gap in China.

to understate the difference between rural and urban prices in China. Table 3 presents a summary of the Brandt-Holz estimates.[14] For a common or joint basket of goods that holds quantities equal, the cost in rural and urban areas for 2004 is given in columns (1) and (2). Urban prices as a percent of rural prices are given in column (3). Several points are worth noting.

First there appears to be much more difference between prices across the provinces than between rural and urban areas within provinces. For example, the joint basket in rural Beijing is 84.7% higher than in rural Chongquing. The largest urban-rural difference between provinces is 43.5% in Chongquing. The costs of a common basket in urban Beijing is 50.9% higher than in urban Chongquing. Table 3 highlights why it is difficult to move move from urban to national prices in a large country like China.

Table 3: Rural-Urban Price Differences by Province (2004)

Area	Rural Prices	Urban Prices	Urban/rural (%)
	Adjusted (1)	Official CPI (2)	Extrapolated (3)
Nationwide	*1486*	*1924*	*129.5*
Beijing	2240	2627	117.3
Tianjin	1795	2120	118.1
Hebei	1320	1807	136.9
Shanxi	1451	2028	139.8
Neimenggu	1429	1864	130.4
Liaoning	1393	1963	140.9
Jilin	1414	1814	128.3
Heilongjiang	1425	1867	131.0
Shanghai	2197	2586	117.7
Jiangsu	1611	2061	127.9
Zhejiang	1541	2076	134.7
Anhui	1663	1843	110.8
Fujian	1561	2127	136.3
Jiangxi	1489	1883	126.5
Shandong	1473	1968	133.6
Henan	1427	1805	126.5
Hubei	1627	2011	123.6
Hunan	1835	1956	106.6
Guangdong	1819	2569	141.2

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[14] In their paper they prefer an adjusted CPI index for rural areas to update their 1990 base estimates. These estimates only go to 2002. In column 1 their estimates have been extrapolated to 2004.

Guangxi	1655	1819	109.9
Hainan	1873	2474	132.1
Sichuan	1471	1911	129.9
Guizhou	1924	1862	96.8
Yunnan	1857	1922	103.5
Xizang	1654	1846	111.6
Shaanxi	1911	1953	102.2
Gansu	1792	1828	102.0
Qinghai	1547	1951	126.1
Ningxia	1683	1871	111.2
Xinjiang	1637	1860	113.6
Chongqing	1213	1740	143.5

Consider the 1993 urban comparison that was made for Guangdong-Hong Kong. This comparison, which involved statisticians from both countries, estimated that the PPP of Rmb/HK$ over GDP was 0.466 when the exchange rate was 0.743, implying a price level 62% of that in Hong Kong. These estimates were done with considerable care but often the attempt to compare the same qualities may have led to selecting items in China that were not commonly consumed. This is particularly true in clothing and footwear where it was estimated that the price level in China was 64% above that of Hong Kong. Further, these bilateral price levels also tend to overstate the prices in China compared to what happens in a multilateral comparison. But even allowing for these factors the price level for Guangdong is likely to have been 55% that of Hong Kong in 1993, much higher than the all-China price level of 25% that PWT and the Bank are using. Are such differences between urban and national price levels plausible?

Looking at Table 3, urban Guangdong prices are 73% above the average for rural China and 34% above urban China. If these factors were used if would suggest the price level in all of China was 35% of Hong Kong. Hong Kong was in turn, 82% of the price level of the United States in 1993, so a price level of China that was under 30% of the US is consistent with these numbers. For 2005 the Asian Development Bank (2007, p. 35) has published their Preliminary Report on purchasing power parities for 24 Asian countries, in which China's price level for GDP was put at 54% of Hong Kong. As noted this is based on prices for 11 Chinese cities, and has been adjusted to an all-China basis in a manner that has not yet been fully described. In the ADB report, the price level of India based on national average prices was estimated at 46% of Hong Kong. We do not as yet

know the relation of Hong Kong to the United States or other OECD countries in Asia, so it is not possible to judge at this time what the final figures will yield. In PWT the price level of Hong Kong in 2004 was 70% of the United States, suggesting price levels for both China and India that are higher than presently in PWT 6.2 or in the World Bank.

Table 4 presents the preliminary estimates based on the calculations suggested above. It implies PPPs for China of 2.87 yuan and India of 13.23 rupees with respect to the US dollar in 2005. Note that the levels of total output of India and China are relatively large, 73% and 30% of the US according to these estimates; Japan is approximately the same as India. Note also that using these PPPs it would take a relatively small differential in growth rates for China to surpass the level of the United States. If the differential were only 2% per annum, it would take 15.6 years, so estimates of 2020 on the basis of these numbers are not unreasonable. Hopefully, the plausibility of these estimates will be better known when the final version of the 2005 Global ICP comparison is released, though even then the error bands will be not be small.

Table 4: Preliminary Estimates for 2005 of Levels of China and India

Country	GDP (billions)	Price Level	GDP (billions)	GDP pc	Population (thousands)	Exchange Rate
	Local currency	US=100	$	$		Local currency/$
China	18387	35	6414	4920	1303720	8.19
India	34339	30	2596	2357	1101318	44.10
United States	8737	100	8737	29468	296497	1.00

Part III: PPPs and Sources of Past and Future Growth

Do the ICP results provide any insights into the sources and prospects for future growth in China and India?   We have already noted that when one converts China or Indian GDP from local to a common currency using PPPs it makes future levels of output more obtainable compared to use of exchange rates. Beyond this, the discussion will concern only two of the common explanations for growth and limitations on future growth, diminishing marginal productivity of capital and structural changes during economic development. The literature is large and we will only take up two recent studies of past growth, both of which compare China and India. Bosworth and Collins

(2006) covers the period 1978 to 2004, and Herd and Dougherty (2007) that goes from 1952 to 2005. Herd and Dougherty, both of whom have been involved in the country studies of China and India of the OECD (2005, 2007), and Bosworth and Collins provide a review of the literature on sources of growth for the two countries; readers are referred to either paper for a fuller discussion.

Some conclusions drawn in the studies are given below:

1. Growth of physical capital has accounted for more than double the growth as in India and has accounted for a larger proportion of total growth.

2. TFP has been a more important source of growth in China than in India in absolute terms in the period of reforms. However, in the 1950-80 period, it was stagnant in China compared to India. Relative to total growth, Bosworth and Collins find it is also more important in China than India, and Herd and Dougherty the opposite.

3. Both papers estimate the contribution to total growth of the reallocation of the work force from the lower productivity primary sector to the higher productivity secondary and tertiary sectors. Both studies find this shift in resources an important source of growth in both countries, more important in China than India during the reform period.

4. Bosworth and Collins put the output per worker in China in the secondary sector as 7 times the primary, while in India secondary is less than 5 times higher than primary. Further, output per worker is higher in both sectors in China than in India, providing China with more potential gains from shifting resources.

5. However, in India the output per worker in the formal sector is almost 20 times as high as the informal sector (agricultural plus informal secondary and tertiary employees), suggesting major potential for output gains.

In looking to the future there are differences in the two studies. Bosworth and Collins see the potential for both China and India to maintain its their recent rates of growth so long as they continue their reforms and participation in the international economy. Herd and Dougherty believe that there are more constraints on future growth in China than India, so long as the latter can achieve major labor market reforms. The discussion below considers the conclusions of these studies from the perspective of purchasing power research that focuses heavily on relative prices.

Role of Capital

In explaining the sources of total factor productivity (TFP) growth in China and India, capital accumulation is seen to play a major role. India makes official estimates of capital stock in rupees but not China. Therefore both studies make independent estimates of the capital stock in China, and allow for both labor quantity and quality, in their analysis, albeit with differences in the adjustments they make. These capital stock estimates are in national prices which tends to overstate the role of capital formation.

China and India follow a common pattern of relative prices that at first may seem paradoxical, namely their prices of investment goods are relatively high. Since both countries are major exporters of producers durable equipment, how can their prices be high? The answer is we are referring to relative prices. We can illustrate this using the GDP price levels of China and India of 23.9 and 17.5 noted above for 2003 from PWT. In comparison the price levels of investment goods including construction are 32 and 35 respectively; so investment goods are still inexpensive with respect to world prices, but not compared to other expenditures in GDP, namely government and household consumption. In contrast, investment goods are relatively inexpensive in countries like Japan and the United States compared to consumption.

This means that in national currencies the share of investment in countries like China and India is over-stated and therefore their ratio of capital to output is over-stated compared higher per capita income countries. Rather than 43% of GDP, PWT would estimate China's investment share at 32% in 2004. That is, the real amount of physical capital that is being put up each year compared to the quantities of other goods is smaller. This is an aspect of relative prices that is frequently overlooked in international

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comparisons of productivity. The effect of using comparable measures of capital to output across countries does not have to decrease contribution of capital to growth but that is certainly a working hypothesis.

However, this finding is related to another unusual aspect of the Chinese economy, the reported 47% consumption out of GDP in 2005, and a correspondingly high rate of savings. Savings can be measured as the (1) net additions of owned assets by the enterprise, household and government sectors of the economy; or as (2) the difference between GDP and consumption expenditures of households and government; or as (3) the sum of foreign and domestic investment expenditures. Most countries are able to independently check estimates from all of these sources, where often (2) is considered the most reliable. In China, GDP is estimated from the production side, and the expenditure side of the accounts is more problematic, with differences that must be allocated to various expenditure headings. It is a common conjecture that China's savings estimates are much too high and consumption levels too low.[15]

Of more relevance is whether continued high rates of investment can contribute to future growth as much as in the past. When economies are re-allocating from low to high output per worker sectors, the impact of the new investment is likely to be higher than when additional investment is directed to increasing capital per worker within a sector. In the Soviet Union and Eastern Europe it was commonly felt that continued high rates of investment in the 35% range would run into diminishing returns as pools of low productivity labor dried up. This is a potential constraint on growth faced by China and to a somewhat lesser extent, India. Herd and Dougherty also believe that India has not freed up their labor markets as much as China since 1978; they conclude there remains more potential for growth from moving labor to higher productivity sectors in India than China.

The Tertiary Sector

One of the curious findings of Bosworth and Collins is that output growth in the tertiary sector of China is higher than in India. This appears paradoxical as China is

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[15] Kraay (2000), provides an analysis of Chinese savings, that while several years old, makes points about over-statement that are still timely.

viewed as producing commodities for the world and India is the call center for the OECD. Maddison and Wu (2007) suggest one factor that may help us understand what is happening here. Transportation and commerce services were 12.4% of GDP in 2003 and 'non-material' services 15.8% in China. Output per worker rose by 4.8% in transport and commerce and 5.1% in 'non-material' services during the period 1978 to 2002. There is little explanation of how one would arrive at that type of labor productivity growth for 'non-material' services that include general government and health and education. 'Non-material' services are very difficult areas of national statistics to pin down, but in general they are thought to be subject to Baumol's disease, where productivity increases are difficult to achieve.[16]

It would be understandable in the case of India that the increase in the proportion of service workers in IT type activities to lead to increases in output per worker. However, in the case of 'non-material' services, which have declined as a share of the tertiary sector, the type of labor productivity growth that China assumes since the reforms began seems much too high. One conclusion is that without further explanation of how China arrives at their high productivity growth for 'non-material' services it seems much more likely that this sector will serve as a constraint on growth rather than a high growth sector.

Returning to Baumol's disease, there is every reason to believe that both China and India will face the same problems of many OECD countries. As income per capita increases, demand shifts to sectors where productivity gains have been harder to achieve than in manufacturing. In this context, it is interesting that one of the productivity gains in marketing in the last 20 years has been reduction of the supply chain from producer to consumer, through direct purchases by final retailers, or one level of wholesalers. In India resistance to the big box stores has been pushed by the small retailers and taken up by some political parties to pass laws restricting their entry. This was a familiar battle in the United States in the 1930s and beyond leading to legislation that provided some restrictions on large retailers. Many of the restrictions of the Robinson-Patman Act had the desirable effect of reducing the types of price-discrimination that do not increase efficiency, but only redistribute gains of reducing the supply chain. See Kumar (2007).

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[16] See for example a recent discussion by Nordhaus (2006).

Part IV: PPPs and Exchange Rates

Several of the participants at this conference are much more knowledgeable about the exchange rate policies and issues of China and India than the author. This section is included because often the PPP of China is discussed in the context of whether China's currency is being undervalued compared to what it would be if it freely floated.

One of the least understood arguments in international economics relates to exchange rates and the purchasing power parity doctrine. After WWI Sweden was concerned as to how it should return the *kroner* to the gold standard, which led Cassel to propose that the Swedish authorities be guided by the purchasing power parity of the *kroner* relative to other currencies defined in terms of gold. This advice was summed up as follows:

> "I propose to call this parity "*the purchasing power parity*[1]. As long as anything like free movement of merchandise and a somewhat comprehensive trade between two countries take place, the actual rate of exchange cannot deviate very much from this purchasing power parity." *Gustav Cassel (1918, 413).*

Samuelson has suggested that if the Nobel economics prize had been awarded in the 1920s, Cassel would have received it for this insight. And surely Cassel would also have modified his views as world financial markets changed and capital movements have come to dwarf trade in goods and services. And there were no national accounts in Cassel's world, so the notion of a PPP for GDP as opposed to one only for traded goods was not in the vocabulary of his day.

Put another way, PPPs are a sensible way to make quantity comparisons across countries by converting expenditures by the relative prices of the items entering into the expenditures. However, the relation of PPPs over GDP to exchange rates is not direct and so is not a simple guide as to the level of a country's exchange rate. In the long run, *the purchasing power parity doctrine* in its relative form which states that, inflation rates, PPPs and exchange rates will move in parallel does tend to hold.

What can be said is that both China and India have ratios of PPPs to their respective exchange rates that are not out of line with countries at similar levels of per capita income. In fact a principal finding of the ICP is that the price level

(PPP/Exchange rate) and the price of non-tradables relative to tradables rise with per capita incomes, with the usual explanation being the Balassa-Samuelson effect.[17] However, the variation about this relationship is especially large for high-income countries, with the price level of Hong Kong as we have noted, about 70, Japan, 137 and Switzerland, 151 in 2004 with the US at 100.

One implication of this wide range of price levels of high-income countries has become clearer in recent months. Policy makers in the Euro bloc have recently become even more vocal about the exchange rate of China than the United States. From the Chinese point of view this is mostly a reflection of the rise of the Euro relative to the dollar rather than any policy of the Chinese. Certainly the asymmetric position of the dollar in international monies complicates this discussion. Again the results of purchasing power studies do not provide any special perspective on this issue nor on the larger issue of why China wants to maintain such large foreign exchange holdings.

Conclusion

Purchasing power studies provide a comparative perspective on the volumes of GDP in a common measure across countries and therefore a reading on how well national growth rates tell the same story over time as do two cross section readings. The paper concluded that compared to India the growth rates of GDP place China at much too low a level at the beginnings of reform and earlier. Much more reasonable results across time and space emerge from use of the Maddison-Wu adjustments for China than from official series. One conclusion is that past official growth rates are not necessarily a good guide to the future for China, even if everything else remains the same. Results from the 2005 global PPP comparisons were not available at the time of writing, but some limitations of the China comparison were discussed, namely the focus of price collection in 11 urban centers and surrounding rural areas. It was suggested that if there were parallels with the 1993 comparison involving Guangdong, the price level of the renminbi is perhaps 30% compared to the US.

The adjustments of Maddison and Wu also call into question the results of TFP comparisons that suggest the service sector has grown more rapidly in China than India. The tertiary sector typically has very slow growth in productivity leading to what has

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[17] This is discussed a number of places, e.g., Summers, Heston and Nuxoll (1994).

been termed Baumol's disease, where as economies become more affluent they demand more services. But services productivity does not grow as rapidly as in manufacturing and even agriculture, so this becomes a constraint on growth. As Maddison and Wu point out the apparent exceptional behavior in China appears to due to assumption about the growth of labor productivity not due to measured productivity increases. Both China and India will face this structural shift to services in their economies that may constrain their future growth. Further, it has been argued that the measurement of capital stock and in national prices both countries, compared to common prices, may account for the large role that capital accumulation has appeared to play in studies of TFP of China and India. In both countries the price of consumption relative to investment is lower than in higher income countries, which is likely to over-state the past contribution of capital, as well as its likely future contribution.

Another major source of post-reform growth has been the allocation of a larger share of the workforce from lower to higher productivity sectors. This will clearly become a constraint on rapid rates of growth in the medium term future. It does seem likely that India does have more potential for growth from such allocation shifts than does China because of the very low productivity in informal enterprises in the secondary and tertiary sectors. At first glance it might appear that purchasing power estimates for countries ought to shed some light on the alignment of their exchange rates. However, based on past studies using the results of the ICP, the exchange rates of China and India are not out of line with those of countries at similar levels of per capita income.

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