

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

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## 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 economic 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.<sup>2</sup> 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’ exchange rate,

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<sup>2</sup> 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>

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.

**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.<sup>3</sup> 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 eyebrows. But when China is compared to India, 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 (1)	India (2)	China (3)	India (4)	India/China (5)
2003	\$ 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

<sup>3</sup> See [pwt.econ.upenn.edu](http://pwt.econ.upenn.edu).

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 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, observers would put China above India at the start of reforms in 1978; this conclusion would be based on a variety of real measures like caloric consumption, energy consumption, primary education and health status. 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.<sup>4</sup> 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.<sup>5</sup> 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.<sup>6</sup> Critics of

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<sup>4</sup> 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 implied 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 Ruoan and Chen Kai (1995), that less so than, Kravis, suggests China's economic position was higher than implied by official growth rates.

<sup>5</sup> 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.

<sup>6</sup> 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.

Chinese growth rates have argued that the Chinese price statistics have underestimated the degree of inflation while defenders (Klein and Ozmuur, 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.

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, OECD members and many other countries including India have followed the UN System of National Accounts over the past 40 years, and compute real GDP growth series by dividing estimates of current production and independently estimated price deflators. The rate of growth is thus 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.<sup>7</sup> 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 or soon will be 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.

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<sup>7</sup> 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 .

Maddison and Wu (2007) have suggested lower growth rates than official rates, namely 7.85% p.a. versus 9.60% 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 Maddison and Wu estimates (MW) and the PWT 6.2 estimates for China and India. Column (1) suggests that compared to 2003 levels of 100, per capita GDP at constant prices was 6.9 in 1952 and only 13.6 at the start of reforms.<sup>8</sup>

**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 applies slightly different weights than contained in the official statistics to the growth rates of the four expenditure components, consumption, investment, government and the net foreign balance.<sup>9</sup>

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?

<sup>8</sup> 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 adjustments of the older national accounts of China that used the Material Product System of national accounts used in Soviet-bloc countries.

<sup>9</sup> 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.

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 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.<sup>10</sup>

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.

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<sup>10</sup> In PWT 6.3 it is proposed to provide series for China using both sets of growth rates.

Compared to exchange rates, the use of PPPs would in 2003 raise China's GDP by a factor of 4.2 and India's by 5.7 relative to the United States in PWT.

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 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 Preliminary 2005 ICP estimates include both China and India as participants and are now available. The other news is that the results have generated a fair amount of controversy primarily because the substantially lower the position of a number of countries in Asia, China and India included, relative to the OECD countries.

#### **1. Some Background on ICP Estimates**

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 4). 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.

## 2. The 2005 Estimates

For 2005 the Asian Development Bank (2007, p. 35) 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.<sup>11</sup> As noted this is based on prices for 11 Chinese cities and their adjacent rural areas; the prices have then been adjusted to an all-China basis by assigning to each city and rural area adjacent areas appearing most similar to that city using cluster analysis. In principle, the price level of India is based on national average prices and was estimated at 46% of Hong Kong. The Preliminary Report on the Global ICP comparison was released on the World Bank website December 17, 2007.<sup>12</sup> What has attracted attention about the Report thus far is the relative lowered position of China and India compared to the United States and other OECD countries.

Table 4 presents the preliminary estimates of the Bank placing China as the 2<sup>nd</sup> largest economy in the world, with Japan 3<sup>rd</sup>, and Germany 4<sup>th</sup>, just above India. These

**Table 4: Preliminary World Bank 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	\$ at PPPs	\$ at PPPs		Local currency/\$
China	18387	42	5333	4081	1303720	8.19
India	34339	33	2341	2126	1101318	44.10
United States	8737	100	12376	41674	296497	1.00
Japan		118	3870	30290	127800	110.2
World		81	54980	8972	6128000	

results are a major departure from exchange rates, but also considerably lower than the numbers in PWT or previous Bank publications. The resources devoted to this round of the ICP in terms of regional consultations and price validations was much more than in previous comparisons. So the 2005 round should be much improved, so the question

<sup>11</sup> The final version of the Asian ICP Report is on the website of the World Bank and Asian Development Bank.

<sup>12</sup> <http://siteresources.worldbank.org/ICPINT/Resources/summary-tables.pdf>

arises as to whether there are there reasons that the new numbers are so much lower than previous estimates for China and India?

### **3. The 2005 Results and Earlier Benchmarks**

This section provides 4 reasons why the 2005 Round might lower Asia's position in the world economy in comparison with previous rounds. We begin with the urban nature of price collection in China; 2nd is the treatment of government administrative services and other non-priced output; 3rd is linking of regional comparisons into the world economy; and 4th is the treatment of the net foreign balance.

#### **3.1 National Average Prices**

China agreed to participate in the ICP in the 1993 and 2005 comparisons but on a limited level, namely providing mainly 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.<sup>13</sup>

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 were 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

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<sup>13</sup> 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)

personal services.<sup>14</sup> These are precisely the items that have not been surveyed or measured very well in most studies.

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.<sup>15</sup> 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 to understate the difference between rural and urban prices in China. Table 3 presents a summary of the Brandt-Holz estimates.<sup>16</sup> 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 Chongqing. The largest urban-rural difference across provinces is 43.5% in Chongqing. The costs of a common basket in urban Beijing is 50.9% higher than in urban Chongqing. Table 3 highlights why it is difficult to move from urban to national prices in a large country like China.

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<sup>14</sup> 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.

<sup>15</sup> The Brandt-Holz estimates have been used by Sicular, et.al. (2007) to compare the rural-urban income gap in China.

<sup>16</sup> 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.

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

Area	Rural Prices	Urban Prices	Urban/rural (%)
	Adjusted (1)	Official CPI (2)	Extrapolated (3)
<i>Nationwide</i>	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
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 it would suggest the price level in all of China was 35% of Hong Kong circa 1993. 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. But is the situation of price collection for the ICP so different in China as other large developing countries?

There are other large countries like India, Nigeria, Egypt, Brazil, Bangladesh or Indonesia, where the extent of coverage of price collection, or adjustment to national averages is not as clear. For the ICP India uses prices in several cities broadly covering the most important regions of the countries. However, in rapidly growing countries like India or China, price collection is not being carried out in an economic environment where spatial differences are close to being in long-term balance. That is disparities are probably larger than they will be in less interesting times, and less well measured than they will be when the framework for price collection catches up with the economies. And the big differences by region are not for commodities, which are easier to price, but for services, where differences can easily be 50% or more. The main reasons for service price differences are site rent which means services provided in large urban areas including housing, must cost more than smaller cities, less accessible regions and rural areas; and the lower wage rates of service workers in these areas.

This raises a more general question for the ICP as between large, diverse countries and smaller city-states. National average prices for countries like Hong Kong, Singapore and Luxembourg are quite fully covered in the outlets used for their CPIs. However, for large countries like Brazil, China or India this is less likely because prices within a country will move in unison over time so the CPI does not have full country

coverage. This means the framework for collecting prices for non-tradable services does not adequately reflect internal price differences within large developing countries compared to very small countries or more affluent highly urban economies. This factor tends bias price levels in large developing countries upward.<sup>17</sup>

A final point relates to the quality of items compared across the wide range of economies in the ICP. On one hand the average quality of goods entering into the CPI tends to be lower in poorer countries so it can be argued that they may match lower quality items with higher quality items in richer countries, making their price levels too low. On the other hand, many of the qualities available and in the CPIs of poorer countries are not available in higher income countries, while the qualities in the CPIs of richer countries can also be found in poorer countries. Also, the higher quality items are frequently international brands while regional or brand-less products are more important for lower quality items. The consequence is that higher quality items tend to dominate the actual list of items compared in the ICP. These items will often not be in the CPIs of poorer countries nor necessarily available in the outlets normally sampled in the CPI, the consequence being to raise price levels of poorer countries. These two effects are in opposite directions and the net impact on comparisons is likely to raise price levels more for countries that do not have much local production, as a small country in Africa, than in say a large country in Asia. More research is needed to evaluate what is the net effect of the quality factor on the overall comparisons. The conclusion drawn from this long discussion of national average prices is that there is some upward bias in the price levels of China, and to a lesser extent, India, compared to affluent and especially very small countries.

#### **4.1 The Equal Productivity Assumption**

How does one compare the output of civil servants and health and education workers across countries? Because these outputs are not typically priced, in past ICP rounds volumes have been derived by dividing compensation by a PPP that was derived from a detailed comparison of salaries for specific occupations. It had been recognized

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<sup>17</sup> This would tend to lower the volume of services if the national accounts adequately capture the expenditures on some of these services, for example the site rent involved in rural housing. Since the national accounts may well miss some of these expenditures, the bias in price collection may well be partially offset, so that volume comparisons are less affected.

that this procedure assumed equal productivity across countries in a given occupation, which was unlikely given very different amounts of capital per worker and opportunity costs of labor across countries. Very low-wage economies have little inducement to organize work to improve productivity of their employees, including in administrative, health and education services. In the 2005 benchmark, the range of countries was much greater than in previous rounds, and some consequences of the equal-productivity assumption loomed much larger. In Asia for example, salaries for the same occupation differ by a factor of 100 between Laos and Hong Kong. Similar differences exist between Yemen and Kuwait in the Western Asia comparison. Without some adjustment for productivity, the resulting per capita volumes in Yemen or Viet Nam would greatly exceed those of its richer neighbors. Such adjustments have been considered before by the OECD and the ICP, but the 2005 Asian comparison is the first actual case where the equal productivity assumption has been significantly modified.<sup>18</sup>

Asia, West Asia and Africa have also carried out such adjustments based on estimates of capital per worker in the whole economy of each country. In Asia, for example, it means that the volume of GDP of China and India relative to Hong Kong or Singapore will be lower than in previous ICP rounds. This poses a problem of comparability across regions in 2005 because EU-OECD-CIS and South America have not made such adjustments. Further, because capital per worker data were not available for many countries, it was often necessary to apply the same adjustment factor low-income countries that were at different stages of development.

What does this mean for comparing the 2005 results for previous benchmarks? In previous benchmarks, the volume of administrative, health and education services for very low wage countries in Africa, Asia, and W. Asia would have been substantially lowered if the 2005 procedure had been adopted in those years. Everything else the same the methods adopted for these sectors has the effect of producing a smaller spread in real GDP per capita between rich and poor in 2005 than in previous benchmarks.

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<sup>18</sup> The report on the 1975 ICP round (Kravis, Heston and Summers, 1982, p. 140) compared PPPs of un-priced services with those of priced services, and the latter are systematically higher for low-income countries. However, it is difficult to substitute priced for un-priced services because most countries do not collect an adequate number of prices for purchased services, but it would be an improvement on the equal productivity assumption.

What is the consequence for the 2005 comparison of the mixed application of an adjustment for productivity. A sense of this can be gained from the magnitude of the adjustment for China and India and the importance of compensation in GDP. Government administrative services and individual services for health and education were 5.2% and 6.7% of GDP in China and India in 2005. Average reported wages were 26% and 22% of the ‘productivity adjusted wages’ in China and India. This means that compared to higher income countries where no adjustment was made, GDP could have been lowered by as much 30%.<sup>19</sup> However, a conservative estimate is that China and India would be at least 20% higher with respect to OECD countries without the productivity adjustment. This is not an argument against a productivity adjustment, though the actual implementation was of a ‘one size fits all’ countries nature; rather it helps us better understand where the new view of the position of China and India in the Global economy of 2005 is coming from.

#### **4.2 Linking of the Regions**

In previous global comparisons linking of regions has often been through only one or two countries, in which case the results can be quite sensitive to which are the link countries.<sup>20</sup> In 2005 a method that was less sensitive to the choice of countries was adopted for linking regions at the basic heading in the ICP.<sup>21</sup> These basic heading parities in each region were used to convert the national currency expenditures in each country to a volume in the currency of the numeraire country of a region, like Oman in Western Asia. The next step is to aggregate these expenditures and parities for each region to a total, like consumption or GDP. In the 2005 this was done by the EKS

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<sup>19</sup> The adjustment factors for China and India are taken from Appendix Table D in the Preliminary Report but were not reproduced in the final report. It is not possible without computations with all of the input data, which will only be made available to researchers at a later date, to make a more precise calculation at the GDP level.

<sup>20</sup> Also the linking can be done at a detailed level or an aggregate level. When it is done at an aggregate level as in 1985, it is particularly sensitive to the link countries, e.g., Japan was used to link Asia to the OECD.

<sup>21</sup> In the parlance of the ICP there were 18 Ring countries from the 5 regions that undertook special pricing. Based on prices from these countries parities at the basic heading level were estimated for the Ring countries that could be linked to each of the 5 regions. The method is described in Diewert (2006). Russia served as the link country between the OECD and the CIS countries in a separate exercise carried out by the OECD.

method, which in effect gives equal weight to Africa, Asia, OECD, South America and Western Asia. PWT, in contrast, uses a method that weights each country by its GDP converted at exchange rates.<sup>22</sup> Without going into the merits of each approach, let it just be said that the PWT approach would tend to increase the share of output of Asia in the global GDP by 13-14% or more compared to the 2005 ICP. And within regions this would have the effect of lowering incomes for countries like Japan and raising them for China and India within Asia. China would be about half the size of the US economy and India under 1/4 the US, but 4<sup>th</sup> largest just above Germany, but still well below Japan.

### **4.3 Exports and Imports**

In the 2005 round the net foreign balance is converted at exchange rates, a practice common in the OECD countries. In fact it has long been recognized that the proper way to deal with trade is to deflate exports by a PPP based on export prices and the same for imports. However, to do this requires collecting of another large set of producers prices, making an already formidable task appear too daunting. PWT does not do it right either as discussed in a recent paper (Feenstra, Heston, Timmer and Deng, 2007).

Are there alternative approaches to a full PPP conversion of exports and imports. What is been done in PWT is to convert the net foreign balance at the PPP for domestic absorption. This has one major advantage for the GK approach used in PWT, namely that it is base-country invariant.<sup>23</sup> In Feenstra, et.al, (2007) it was found that there was a significant difference for a number of high trade countries between GDP based on expenditures as in PWT and GDP based on production taking into an account of the difference in parities and volumes of exports and imports. However, among the 145

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<sup>22</sup> While the Bank and PWT are closer to each other than to the 2005 ICP for China the comments in this section only apply to PWT. The World Bank uses a different method to obtain their WDI numbers. Also, with respect to next point to be taken up, the net foreign balance, the comments only apply to PWT. The WDI for 2005 relied on extrapolation of 1993 results at the GDP level. This means that if exports are constant but their prices fall, as in the case of micro-chips for Singapore, GDP growth will overstate the ability of Singapore to convert current production into current domestic expenditures in 2005 that underlies their benchmark estimate of GDP. Other changes in the terms of trade will similarly drive a wedge, positively or negatively, between extrapolations and current price PPP conversions.

<sup>23</sup> In PWT the aggregation is over C, I and G, and the net foreign balance is handled as a separate item. In EKS as usually carried out, the net foreign balance is included in the aggregation with the exchange rate as the parity for that entry. Other conversion factors could also be used within EKS, or for that matter in the GK approach.

countries in the 2005 ICP there are a number in Asia, Africa and Western Asia, where this difference can be quite large.

What conclusions can be drawn about where China and India fit into the world economy based on the 2005 benchmark? The largest source of difference from past practice is the productivity adjustment for government, which certainly is a change in the right direction. However, my judgment is that these adjustments produced too large a reduction for China and India. In addition because the adjustments were not carried out in the OECD, the most important region for comparison, the overall results for Asia are understated in this round. The difference in aggregation methods also operated to reduce Asia substantially in the world, and there is legitimate disagreement on whether this was appropriate. The difference in treatment of foreign trade is in any event not a large effect. The special pricing in China may well have produced prices that were on average higher than for other large countries like Brazil or India. Until the Bank releases its final report and final arrangements are put in place for researchers to gain access to the underlying data no very precise estimates can be made. A rough guess as to what might be the net impact of defensible changes in the preliminary results would be to reduce price levels of China and India relative to the US by 20 percent plus or minus at least 5%. Put another way much publicized reduction of the incomes of China and India by 40% can probably be roughly half explained by improved data and methods and a productivity adjustment for those expenditure headings where PPPs have been based on relative wages.

### **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 a larger proportion of total growth in China compared to India.
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, aside from the common emphasis on maintaining high rates of investment, there are differences in the two studies. Bosworth and Collins see the potential for both China and India to maintain 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 and Relative Price of Investment Goods**

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 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.<sup>24</sup>

### **Financial Repression and the Efficiency of Capital Use**

In his paper in this volume, Jehangir Aziz (2007) asks the question of whether estimated growth from a model without financial frictions tracks actual experience and compared to a model that does introduce wedges in financial markets. He finds that a financial repression model does the better job of tracking Chinese experience. He considers the wedge as a borrowing constraint on smaller privately owned firms as well as due to a repressed banking system replete with non-performing loans. The very high savings rates in China represents a tax on consumers and on small businesses that must seek financing from their own savings. Consumers must save more because the returns they can earn on assets is low because of the low cost of capital made available to State Owned Enterprises (SOEs). And small firms are constrained in access to credit so they must rely on a great deal of internal financing. In contrast, Aziz argues that when account is taken of subsidies for energy and other costs, SOEs effectively have negative borrowing rates so if they can make investments, the incentive is there to invest at any positive return.

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<sup>24</sup> Kraay (2000), provides an analysis of Chinese savings, that while several years old, makes points about over-statement that are still timely.

Perkins and Rawski (2008) has made a related argument that the investment choices made by the SOEs and other government related entities have made for a very inefficient use of capital because of the absence of incentives to optimize choices when the cost of capital is so cheap. Is this claim that China's investments have been poorly allocated consistent with the TFP studies cited above? The answer is yes because high rates of investment have been associated with high growth of output, but probably not the source of this growth to the extent implied by these studies. Because the labor force reallocations have been underestimated because of residential permit system, this latter source of growth has probably been underestimated.

**Table 4: Completed Investment in China by Quarters**

Year	1975	1990	2000	2002	2003	2004	2005
Q1+Q2	33.8	28.3	31.1	33.7	35.3	37.3	37.2
Q4	42.6	48.3	44.4	39.9	37.8	35.1	35.1

Source: Adopted from Perkins and Rawski (2008) Table 20.9

One piece of evidence cited by Perkins and Rawski (Table 20.9, 2008) is the seasonal aspect of investment in China. Table 4 shows that in pre-reform China in 1975, over 40% of investment occurred in the 4<sup>th</sup> quarter while only 1/3<sup>rd</sup> of annual investment took place in the 1st two quarters. Rawski argues that this illustrates the situation where SOEs had more funds than good ideas and so made a rush to invest in poorly planned projects in the last quarter of each year. The evidence in Table 4 suggests this seasonal pattern was maintained or even more exaggerated in the first 15 years of reform and only in the more recent years when the share of private investment has increased has the allocation become more evenly distributed.

There are two possible qualifications to this argument. First, it might be argued that this investment pattern is somehow seasonally related to weather conditions, construction conditions being unfavorable in the 1st quarter of each year. To check on this provincial investment patterns were related to January and annual average temperatures, and indeed there is the expected relationship. However, correcting for this, there still remained a substantial excess of investment in the 4<sup>th</sup> quarter compared to the 1st quarter in all provinces.<sup>25</sup>

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<sup>25</sup> The coefficient on January temperatures was positively and significantly associated with the ratio of 1st to 4<sup>th</sup> quarter investment across the 31 provinces in 2003 and 2006, the only two years examined. The

A second qualification is that if current price investment is growing due to either price changes or real changes, then one would expect that 4<sup>th</sup> quarter investment to be higher than 1<sup>st</sup> quarter investment. It is easy enough to allow for this effect by calculating expected levels in each quarter using quarterly growth rates derived from the annual increase in a given year. For example, in 2006 the expected national ratio of 1st quarter to 4<sup>th</sup> quarter investment was .849 whereas the actual ratio was .367, a clear indication of the crowding of investment into the 4<sup>th</sup> quarter.

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. In conclusion, we would argue that TFP studies show that China and India can gain from additional investment but that the notion that is the desirable engine of growth seems problematic. Efficient use of capital coupled with facilitating continued movement of low productivity labor to more productive sectors would move both countries much closer to their production possibility frontier.

### **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 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

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equation did a good job of prediction for the colder provinces like Jilin, Liaoning, Heilongjiang and Inner Mongolia. However, the residuals were much larger for provinces with above freezing January temperatures, and may be related to the extent of private investment in the province. If we made an upward adjustment in 1st quarter investment for those provinces with negative January temperatures, the overall effect would be to raise the national ratio by under .01, say .37 to .38 in 2006.

happening here. Transportation and commerce services in China were 12.4% of GDP in 2003 and 'non-material' services 15.8%. Officially 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.<sup>26</sup>

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 assumed in China since 1978 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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<sup>26</sup> See for example a recent discussion by Nordhaus (2006).

#### **Part IV: PPPs and Exchange Rates**

In this section 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*”<sup>1</sup>. 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. This was true in both the older and even more so for the 2005 ICP comparison. 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.<sup>27</sup> However, the variation

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<sup>27</sup> This is discussed a number of places, e.g., Summers, Heston and Nuxoll (1994).

about this relationship is especially large for high-income countries, with the price level of Hong Kong in the draft Global Report, 73, Japan, 118 and Switzerland, 140 in 2005 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. However, the paper by van Ark, Erumban, Chen and Kumar (2007) in this volume does make a strong case that unit labor costs in China and to a lesser extent, India have been highly competitive since 1990 compared to peer countries like Hungary, Korea, Mexico and Poland.

### **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. Preliminary results from the 2005 global PPP comparisons suggest a much lower GDP than the World Bank or PWT had been using, but it is not clear whether this has any implications for the discussion of Chinese growth rates.

One concern about the China comparison was discussed in some detail, namely the limitation of price collection to 11 urban centers and surrounding rural areas. In addition both China and India share similar problems in adequately representing their national price structure compared to small countries, like Hong Kong or Singapore.

Further the linking of the whole Asian region to the other regions is quite different in the 2005 Global Report than in PWT. In this the Bank followed the methods used in Eurostat and the OECD. The overall impact of the new Bank ICP for 2005 is to lower the share of Asia compared to the OECD, a different world economic view than that previously held.<sup>28</sup>

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 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.

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. Further, it has been argued that the measurement of capital stock is in national prices in both countries, which are higher compared to common prices. This may account for the large role that capital accumulation has appeared to play in studies of TFP in India and even more so in China where the movement of labor to higher output sectors has been understated. 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

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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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