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MEASURING THE ECONOMIC PERFORMANCE OF TRANSITION ECONOMIES: SOME LESSONS FROM CHINESE EXPERIENCE

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This article quantifies the comparative performance of China in several dimensions. Firstly, it shows that China's move from a command to a market economy was less abrupt and more successful than that of 29 other economies making a similar transition. Secondly, while official estimates show annual GDP growth of 9.6 percent in 1978–2003, this is reduced to 7.9 percent after adjustment for exaggeration of industrial performance and growth in non-material services. Thirdly, as the exchange rate understates China's achievement, a purchasing power parity (PPP) converter is necessary to measure comparative *level* of performance. Our PPP converter shows that China in 2005 was the world's second largest economy, with a GDP about 80 percent of the U.S. It is assumed that China will have overtaken the U.S. as the world's biggest economy before 2015. Until recently, the World Bank estimate of the PPP for China was close to that of Maddison, but the Bank's new estimate for 2005 shows Chinese GDP about half this level. The Bank's new estimates for China and other Asian countries are not plausible, and this paper advances several reasons for rejecting them. Finally, energy use per head of population is a good deal smaller than that of the U.S., and its total energy use for a much bigger population is likely to be somewhat smaller than that of the U.S. in 2030. However, heavy dependence on dirty coal means that it will have bigger carbon emissions than the U.S. This is a major problem as Beijing and other big cities already have severe pollution problems.

Introduction

Until 1990, it was generally accepted that the national accounts statistics of communist countries needed adjustment when comparison with capitalist performance was required. Now that communism has largely disappeared there is a tendency to take the new official statistics at face value. My approach is comparativist. Comparativists never take official measures as sacrosanct. Macromeasurement has a long pedigree, and serious scholars neglect problems of comparability at their peril.

Transition countries are former communist command economies which have moved toward capitalist modes of resource allocation, property ownership, international trade and capital movement. In China the transition started in 1978; in Eastern Europe and the successor states of the Soviet Union after 1990. In Eastern Europe the objective was to move quickly to a competitive capitalist economy. In Russia, the first phase involved a rapid handover of state assets at knock-down prices to oligarchs; this has now changed, with significant moves toward state

Note: This is a revised version of the keynote address to the Beijing Conference of IARIW and NBS on problems of measuring the performance of transition economies, September 19, 2007. As I was unable to attend for health reasons, my paper was presented by Bart van Ark. I am very grateful to Bart for augmenting the coverage of the paper. I have commented here in some detail on the validity of the new ICP estimates of purchasing power parity and real income levels by the World Bank which appeared in 2008. I am grateful for comments from Harry Wu, Michael Ward, Derek Blades, David Roberts and Alan Heston.

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capitalism. In China the goal was to move pragmatically to a hybrid system with expansion of market incentives, gradual attrition of the state sector in favor of more or less competitive capitalist enterprise. Unlike most of the transition economies, it retained communist party governance.

Table 1 lists the performance of 30 transition countries since 1973. Most successor states of the USSR performed very badly in the initial years of system change; in Eastern Europe the improvement was mediocre. China and Vietnam were very different. They greatly augmented the pace of their growth. Together these 30 countries accounted for 21 percent of world GDP (measured in 1990 Geary–Khamis dollars) in 2003. China and Vietnam accounted for 15.6 percent, the others 5.4 percent. All had formerly used the Soviet material product system (MPS) to measure economic performance, and have now in principle switched to the SNA system.

TABLE 1

Per Capita Performance and GDP Levels in 30 Transition Economies 1973–2005

	GDP Per Capita (1990 PPP $)			Growth Rate		GDP (million 1990 PPP$)
	1973	1990	2005	1973–90	1990–2005	2005
Armenia	6,152	6,066	8,428	–0.80	2.20	25,140
Azerbaijan	4,434	4,639	4,657	0.27	0.03	36,847
Belarus	5,233	7,184	9,014	1.88	1.52	92,842
Estonia	8,657	10,820	17,342	1.32	3.19	23,117
Georgia	5,932	7,616	4,724	1.48	–3.10	22,092
Kazakhstan	7,625	7,458	9,156	–0.13	1.38	139,044
Kyrgyzstan	3,727	3,602	2,452	–0.20	–2.50	12,616
Latvia	7,846	9,916	11,856	1.39	1.20	27,150
Lithuania	7,593	8,663	9,280	0.78	0.46	33,379
Moldova	5,365	6,165	2,908	0.82	–4.89	13,230
Russian Fed.	6,582	7,779	7,270	0.99	–0.45	1,042,722
Tajikistan	4,095	2,979	1,246	–1.85	–5.65	8,926
Turkmenistan	4,826	3,626	3,001	–1.77	–1.25	14,861
Ukraine	4,924	6,027	4,142	1.20	–2.47	194,665
Uzbekistan	5,097	4,241	4,202	–1.18	–0.92	112,825
Former USSR	6,059	6,890	6,264	0.76	–0.66	1,799,456
Albania	2,273	2,499	3,509	0.56	2.91	12,501
Bulgaria	5,284	5,597	7,248	0.34	0.54	53,974
Czechoslovakia	7,401	8,512	10,843	0.83	1.61	168,567
Czech Rep.	n.a.	8,895	11,045	n.a.	1.40	113,042
Slovakia	n.a.	7,763	10,465	n.a.	2.07	55,525
Hungary	5,596	6,459	8,722	0.85	1.94	89,338
Poland	5,340	5,113	8,381	–0.26	3.52	327,466
Romania	3,477	3,511	3,974	0.06	0.67	88,736
Yugoslavia	4,361	5,720	5,331	1.61	0.17	133,395
Bosnia	n.a.	3,737	6,224	n.a.	3.58	28,016
Croatia	n.a.	7,351	7,869	n.a.	0.44	35,380
Macedonia	n.a.	3,792	3,554	n.a.	–0.12	7,267
Serbia	n.a	5,180	2,811	n.a.	–3.10	31,784
Slovenia	n.a.	10,160	15,214	n.a.	2.46	31,118
Eastern Europe	4,988	5,440	7,204	0.51	1.89	874,517
China	838	1,871	5,578	4.84	7.55	7,238,725
Vietnam	836	1,025	2,456	0.12	6.00	205,162

Notes: Montenegro split off from Serbia in 2006; Kosovo in 2008.
Source: www.ggdc.net/Maddison.

Difference between MPS and SNA Measures of Economic Growth

MPS took a narrower view of economic activity than SNA. It excluded many service activities considered "non-productive" (passenger transport, housing, health, education, entertainment, banking, insurance, personal services, government and party administration and the military). Growth was not generally measured by constructing Western-style volume indices, but by deflating current values by price indices. The price system and tax structures were different from those in capitalist countries, and measurement conventions gave incentives to exaggerate quality change when new products were introduced. Abram Bergson (1914–2003) pioneered procedures for re-estimating Soviet GDP on a basis corresponding approximately to Western conceptions. His corrective procedures were applied by a team of Central Intelligence Agency (CIA) Sovietologists in Washington. In New York, Thad Alton and his colleagues did the same for Bulgaria, Czechoslovakia, East Germany, Poland, Romania and Yugoslavia. The CIA attempted to do the same for China, but the quality of their work was much worse than that for the USSR and Eastern Europe.

CIA research was financed for intelligence purposes, but was publicly available in annual reports to the U.S. Congress. Maddison (1995a, pp. 139–46), discussed the problems of adjusting the MPS numbers to get comparability with Western performance. He presented an extensive appraisal of 20th century growth estimates for Eastern Europe, the 15 republics of the USSR, and China).

Some idea of the impact of CIA adjustment can be seen by comparing the official Soviet estimates of growth of net material product for 1950–90 (6.1 percent a year), and the CIA measure of GDP growth (3.5 percent a year) for the same period (see Maddison, 1998b, p. 312). CIA measurement activity was abandoned in 1991 and all these countries switched to the SNA system in principle. There were major problems in the transition period which made accurate measurement difficult. One was the political disintegration of these countries. In 1990, there were only nine communist countries in Europe. East Germany, Yugoslavia, Czechoslovakia and the USSR have disappeared and 24 successor states have now emerged (15 from the USSR, 7 from Yugoslavia, 2 from Czechoslovakia).

Political disintegration involved changes in the mode of governance, big changes in the pattern of production and income distribution, creation of new currencies and exchange rates, much wider openness to international trade, and in some cases armed conflict.

For 1990–2003, I used GDP growth estimates of the Economic Commission for Europe for Albania, Bulgaria, Romania, Slovakia and former Yugoslavia; OECD national accounts for the Czech Republic, Hungary and Poland; IMF *World Economic Outlook* for the successor states of the USSR, and *Key Indicators* of the Asia Development Bank for Vietnam. For 2003–05, I used IMF *World Economic Outlook*. However, I have not been able to test the accuracy or comparability of these growth measures.

The Chinese case is different. With the help of Professor Harry Wu, I made significant adjustments and a detailed scrutiny of the official estimates (Maddison, 1998a). This exercise was updated in a second edition (Maddison, 2007b); it showed

an average annual GDP growth in 1978–2003 of 7.85 percent compared to the official 9.59 percent.

Measuring Comparative Levels of Economic Performance

Apart from the problems of growth measurement, it is important to convert national currencies into a common unit in order to measure *levels* of performance. By merging time series for economic growth with cross-country estimates of GDP levels, we can make coherent time–space comparisons. Exchange rates are the simplest option for cross-country comparisons, but are misleading as they mainly reflect the purchasing power of traded items. The second option is to use purchasing power parity converters (PPPs) which have been developed by cooperative research of national statistical offices and international agencies in the past few decades. The expenditure approach, pioneered by the Organisation for European Economic Co-operation in the 1950s on a bilateral basis, was developed much further by Kravis, Heston and Summers on a multilateral basis in their ICP (International Comparisons Project). We have reasonably comparable estimates of this kind for 70 countries for my benchmark year 1990, and shortcut PWT (Penn World Tables) measures developed by Kravis, Heston and Summers for another 84 countries. The ICP multilateral approach is a highly sophisticated comparative pricing exercise. The most satisfactory variant is the Geary–Khamis approach which gives a weight to countries corresponding to the size of their GDP. Appendix Table A.1 shows the derivation of the 1990 Geary–Khamis PPP converters for the USSR and Eastern Europe.

A third PPP option is the ICOP (International Comparison of Output and Productivity) variant developed at the University of Groningen. This involves comparison of value added by industry of origin, rather than by expenditure. Ren Rouen's bilateral Chinese/U.S. comparison for 1987 used both the ICP and ICOP approach (see Ren, 1997); I updated his expenditure results to 1990, and adjusted them to a Geary–Khamis equivalent (see Maddison, 2007b).

It is clear from Appendix 1 that GDP valued by PPP is substantially higher than exchange rate valuations, with a range of 3:1 in Poland to 1.3:1 in Yugoslavia. In China the difference is more extreme, with PPP more than five times higher than the exchange rate. Unfortunately, the need for PPP conversion is frequently neglected; thus Lord Patten, the last British governor of Hong Kong, in a retrospective article in the *International Herald Tribune* on June 22, 2007, suggested that in 1997, the GDP of Hong Kong was 22 percent of that of China. My estimate, using a PPP converter, shows that Hong Kong's GDP was less than 4 percent of China's GDP in 1997. Frequently, Japan is cited as the world's second biggest economy, when its GDP is less than half the Chinese. Another example is the exaggeration of China's role in global warming: it is often suggested that China is especially delinquent as an emitter of greenhouse gases. In 2003, its carbon emissions were 0.63 tons per thousand dollars of GDP if the official exchange rate is used. This is very much higher than the 0.19 tons per thousand dollars of GDP in the U.S. When PPP converters are used, the Chinese ratio is lower than that of the U.S. (0.17 tons per thousand dollars of GDP; see Table 9).

Adjustments to the Official Chinese Growth Estimates, 1952–2003

Figure 1 provides a confrontation of the official and our alternative GDP measure for 1952–2003. Our GDP measure shows slower growth than the official growth rate. Generally, the contours are similar, but there is a kink in our curve in 1996–99, where we show significantly slower growth than the official estimates,

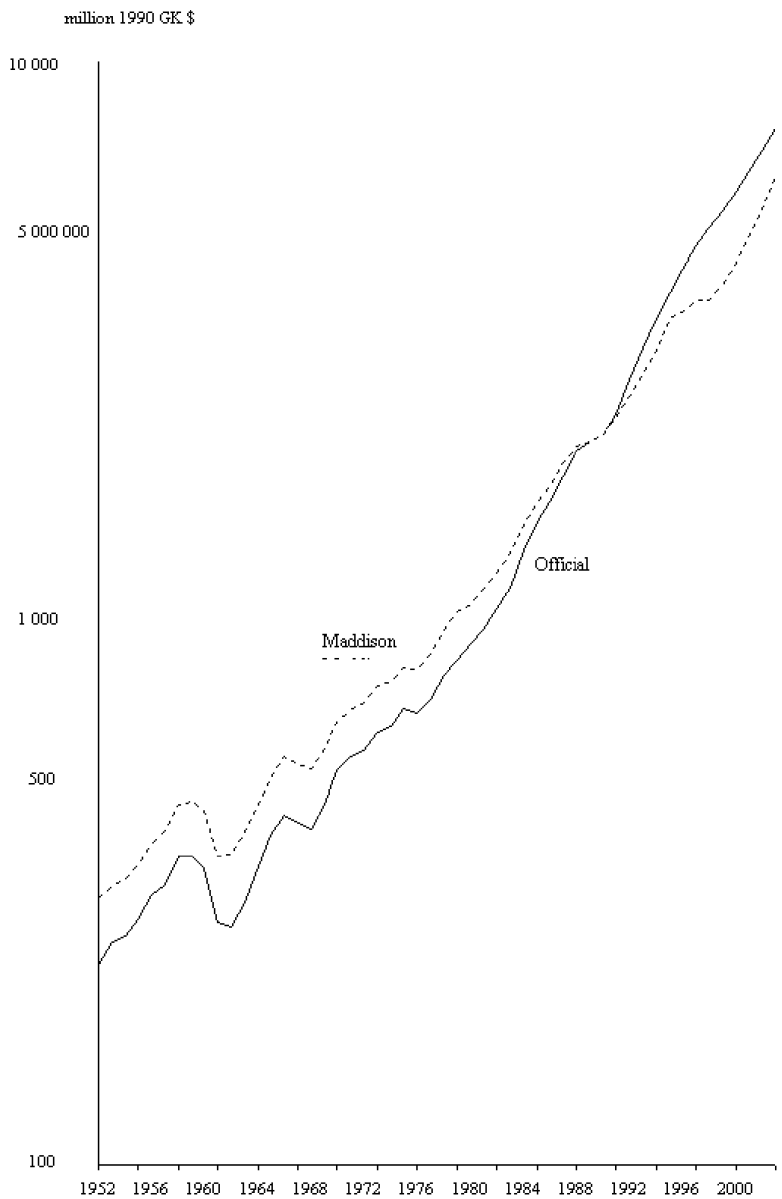

Figure 1. Confrontation of Official and Maddison Estimates of GDP Level, 1952–2003

and faster growth thereafter. This suggests that the official estimates for these years were deliberately smoothed.

The official Chinese estimates for 1952–78 are no longer published in the *China Statistical Yearbook*. In the 1988 Yearbook (pp. 28 and 42), there were two official estimates of aggregate economic performance. The "total product of society" showed average annual growth rate in "comparable prices" of 7.9 percent for 1952–78. It referred to aggregate gross output of five sectors and involved a good deal of double counting because each of the component sectors had significant inputs from the others. "Net material product," which the Chinese called "national income" showed 6 percent growth for the same period at "comparable prices." This was better as it deducted most inputs except "non-material services." These Soviet style measures have now been jettisoned.

What are the Present Official Estimates?

There was a joint retrospective exercise by the Chinese statistical office and Hitotsubashi University in 1997 which provided an approximation to Western type estimates for 1952–95. This exercise showed a GDP growth rate of 4.7 percent a year for 1952–78, and it is these estimates which I have considered official for these years. The Maddison–Wu revisions (Maddison and Wu, 2008) show a GDP growth rate of 4.4 for this period.

For 1978–2003, official estimates are published annually in the *China Statistical Yearbook*. There is a continuous series in current prices, but constant price GDP is shown only as annual percentage changes. They are based on SNA guidelines, but there is still room for improvement.

I reconstructed Chinese GDP by industry of origin. I made my own estimates for 125 crop and livestock items from FAO sources, adjusted for farm and non-farm inputs. I found approximately the same rate of growth as the official estimates for 1952–90. In view of the close congruence with the official estimates up to 1990, the official estimates were used to update the Maddison estimates from 1991 to 2003.

For industry, Wu's 2007 estimates of gross value added were used (see Wu, 2002, for details of his methodology). He constructed a volume index, with detailed time series on physical output and prices from the *China Industrial Economic Statistical Yearbook*. Value added was derived from the official input–output table. Wu's sample covered 117 products, with detailed time series showing annual movement for 15 branches of manufacturing as well as mining and utilities. His growth rate was 10.1 percent a year for industry as a whole for 1952–78, compared to the official 11.5 percent; and 9.75 percent a year for 1978–2003 compared to the official 11.5 percent.

For construction I used the official estimates throughout. For transport, communications, commerce and restaurants I used the estimates of Liu and Yeh (1965) for 1952–57 linked to the official measures thereafter.

I made a major adjustment to growth in "non-material services" (banking, insurance, housing services, administration of real estate, social services, health, education, entertainment, personal services, R&D activities, the armed forces, police, government and party organizations). These were excluded from the old MPS accounts, but are now included. I assumed zero productivity growth in these

TABLE 2

GDP Per Person Employed in OECD Countries, 1973–90
(annual average compound growth rates)

	Agriculture	Industry	Non-Material Services	Other Services
Denmark	6.42	2.24	0.26	1.76
France	5.22	3.01	0.98	1.84
Germany	5.48	1.83	1.00	2.62
Italy	3.35	3.14	0.00	1.12
Netherlands	4.25	1.63	–1.00	1.60
Spain	6.26	4.74	1.35	2.15
Sweden	3.84	2.12	–0.20	1.71
U.K.	3.77	2.79	0.57	1.25
U.S.	2.95	1.20	–0.11	0.77
Average	4.62	2.52	0.32	1.65

Source: van Ark (1996, pp. 109–15).

TABLE 3

Maddison–Wu and Official Estimates of GDP Growth (annual average percentage change)

	Agriculture	Industry	Construction	Transport & Comm.	Commerce & Restaurants	Non-Material Services	Total GDP
1952–78							
Maddison–Wu	2.2	10.1	7.2	6.0	3.3	4.2	4.4
Official	2.1	11.5	7.2	7.5	4.3	5.7	4.7
Diff. Official—Maddison–Wu	–0.1	1.4	0.0	1.5	1.0	1.6	0.3
1978–2003							
Maddison–Wu	4.5	9.8	9.8	10.8	9.9	5.6	7.9
Official	4.5	11.5	9.8	10.8	9.9	11.0	9.6
Diff. Official—Maddison–Wu	0.0	1.7	0.0	0.0	0.0	5.4	1.7

Source: Official estimates for 1952–78 are based on NBS and Hitotsubashi University estimates (1997); 1978–2003 official from NBS, China Statistical Yearbook.

services and used employment as a proxy measure of output. I did this because it is the recommended procedure in the international standardized *System of National Accounts* (Eurostat *et al.*, 1993, p. 134). In OECD countries, average productivity growth in this sector is very small (see Table 2), but NBS assumed Chinese productivity growth of 5.1 percent a year from 1978 to 2003 (faster than labor productivity growth in the rest of the service sector).

The official estimate of average annual GDP growth in 1978–2003 was 9.59 percent a year; after three adjustments it fell to 7.85 percent. The zero productivity assumption for services reduced it by 0.82 percent; the amendment for industry reduced it a further 0.79 percent; a small reduction of 0.03 percent was due to differences in sectoral weights between my estimates and the official measures.

Tables 3 and 4 summarize my adjustments to the official estimates of GDP growth and level.

Estimating the Level of Chinese GDP

Table 5 compares my estimates of the Chinese GDP level in 2005 in 1990 Geary–Khamis dollars, with two alternative estimates of the World Bank. For several years, the Bank has published estimates in its *World Development Indica-*

TABLE 4

MADDISON AND OFFICIAL ESTIMATES OF GDP LEVEL (IN 1987 YUAN)

	Agriculture	Industry	Construction	Transport & Comm.	Commerce & Restaurants	Non-Material Services	Total GDP
1952							
Maddison–Wu	127,891	17,796	3,658	5,183	14,272	45,486	214,286
Official	112,038	11,111	3,658	3,637	11,225	13,879	155,548
Maddison/Official	1.14	1.60	1.00	1.43	1.27	3.28	1.38
1978							
Maddison–Wu	225,079	219,314	22,292	23,617	33,383	131,448	655,133
Official	190,577	188,214	22,292	23,617	33,383	58,972	517,055
Maddison/Official	1.18	1.17	1.00	1.00	1.00	2.23	1.27
2003							
Maddison–Wu	679,821	2,246,790	231,926	305,202	356,931	514,495	4,335,165
Official	572,302	2,836,009	231,926	305,202	356,901	801,926	5,104,266
Maddison/Official	1.19	0.79	1.00	1.00	1.00	0.64	0.85

Source: Official estimates for 1952–78 from NBS and Hitotsubashi University (1997); 1978–2003 from NBS, China Statistical Yearbook. Maddison estimates from Maddison (1998a, 2007a).

TABLE 5

THREE ESTIMATES OF PPP ADJUSTED CHINESE/U.S. PER CAPITA GDP LEVELS

Maddison (1990 Geary–Khamis $)						
	Ch GDP	U.S. GDP	Ratio	Ch pcap	U.S. pcap	Ratio
2003	6,188	8,431	0.73	4,803	29,037	0.17
2005	7,269	9,008	0.81	5,578	30,458	0.183
World Development Indicators						
	Ch GNP	U.S. GNP	Ratio	Ch pcap	U.S. pcap	Ratio
(2005 Fisher Binary PPP)						
2005	8,610	12,434	0.69	6,600	41,950	0.16
World Bank 2005 EKS PPP						
	Ch GDP	U.S. GDP	Ratio	Ch pcap	U.S. pcap	Ratio
2005	5,332	12,376	0.43	4,091	41,674	0.098

Source: Top panel: 2003 from Maddison (2007b); 2005 derived by applying a "correction coefficient" to the official NBS estimate of GDP growth 2003–05. The coefficient was the ratio (0.8177) of the Maddison growth estimate for 1978–2003 to the official growth rate for that period. Middle panel from World Bank (2007, pp. 14–17); their PPP was derived from Ren and Chen (1994). Bottom panel from World Bank (2008).

tors for 152 countries. Instead of GDP, it showed GNP (gross national product, i.e. GDP plus net earnings from foreign sources). The description of PPP sources was rather skimpy, and it is clear that the Bank was eclectic in using estimates from a wide variety of sources. For China, the Fisher binary China/U.S. estimate of Ren and Chen (1994) was used, updated from 1986 to 2005. The ratio of Chinese/U.S. per capita GNP was close to my Chinese/U.S. GDP ratio. This is not surprising as I also used a Fisher estimate by Ren (1997) which I adjusted to a Geary–Khamis basis (see Maddison, 2007, appendix C).

The bottom panel of Table 5 shows the preliminary results of a very large PPP exercise of the World Bank in cooperation with five regional offices. It was conceived as an extension of the International Comparisons Project (ICP) initiated by Irving Kravis in 1968. The World Bank used the results of the five regional studies and linked them using the EKS method of aggregation. This means that the ranking of countries within each region could not be modified in the linking process, because the regions insisted on "fixity." In fact, the EKS method is likely to produce a lower relative standing of low income countries than the Geary–

Khamis method.Appendix Table A.4 shows the difference between the World Bank and Maddison estimates for 2005 for 130 countries which account for 95 percent of world GDP. It is clear that for China, India, Indonesia, Korea, Pakistan, Thailand and Vietnam, the World Bank estimates are biased downwards.

A major shortcoming of the recent World Bank study is its disparaging attitude to the five previous ICP global studies (three by Kravis, Heston and Summers and two for 1980 and 1985 by the UN Statistical office). These are dismissed by the World Bank (2008, p. 10) as being "based on very old and very limited data," implying that any discrepancy with earlier findings cannot cast doubt on its implausible results for China, India and some other Asian countries. In fact, ICP III of Kravis, Heston and Summers contained a detailed and sophisticated analysis explaining the sensitivity of PPP results to different measurement techniques, which is completely lacking in the World Bank book. A vast heritage of regional PPP studies and Heston–Summers short-cut estimates is also available for comparative crosschecks and space-time comparisons (see Maddison, 1995a) but the World Bank has ignored them in its assessment of the new results. The most obvious shortcoming is the scrapping of the Geary–Khamis measure of PPP in favor of the EKS method favored by bureaucrats. It gives all countries the same weight, whatever their size, putting Luxemburg on a par with the U.S. This method systematically exaggerates the per capita income differential between rich and poor countries. Geary–Khamis gives a weight to countries corresponding to the size of their GDP and shows smaller differentials.

The standing of China relative to the U.S. is much lower in this new ICP exercise than in the two other approaches in columns 1 and 3 of Table A.4. It estimates Chinese per capita income to have been less than 10 percent of the U.S. level in 2005, compared with 18.3 percent using the Maddison approach. The percentage difference is much larger than one might expect between an EKS and a Geary–Khamis measure; in the 1982 study of Kravis, Heston and Summers (Kravis *et al.*, 1982, p. 96), their average Geary–Khamis GDP result for the lowest income group was 16 percent higher than the EKS measure. There is therefore reason to ask whether the statisticians in charge of estimating Chinese price levels did not exaggerate them. This was the first time that China was involved in an ICP exercise, and it submitted estimates of the price level in 11 cities (Beijing, Shanghai, Ningbo, Qingdao, Guanzhou, Xiamen, Dalian, Harbin, Wuhan, Chongqing and Xi'an) rather than a national average (see Asian Development Bank, 2007, p. 116). Michael Ward has suggested to me that, in aiming at comparability with advanced countries, the Chinese statisticians probably made "a disproportionate selection of items at the higher end of the product range." Thus they failed to obtain a representative consumption profile of the average Chinese household (see Table A.3 for the wide disparity of income levels between the 31 Chinese provinces).

One obvious crosscheck on the plausibility of the World Bank results for China is to examine their intertemporal implications, by merging level and growth estimates. My growth estimate shows Chinese per capita income increasing 12.5-fold between 1950 and 2005 (see Maddison, 2007b, p. 157). If we merge the World Bank level estimate for 2005 with my growth estimate, one gets the following: per capita GDP of EKS $4,091 in 2005, and EKS $326 in 1950. However, if we measure the intertemporal change in 1990 Geary–Khamis units using the World Bank's 2005

China/U.S. ratio of 10 percent, Chinese per capita GDP would be GK $3,052 in 2005 and $243 in 1950. Both 1950 estimates are well below subsistence level. This suggests that the World Bank's estimates are doubly biased—by use of EKS, and by over-representing high priced luxury goods. The implausibility is greater if one believes the official estimate of per capita GDP growth (21-fold over 55 years). For these reasons I stick to the 1990 Geary–Khamis numeraire which I used in time–space comparisons over two millennia in three books and on my website (www.ggdc.net/Maddison). It provides a much more plausible understanding of the comparative performance of China in the world economy over the past decades.

Growth Accounting

Growth accounting is a very useful technique for analyzing the dynamic forces in economic growth, and reasons for inter-country differences in performance. Table 6 shows comparative growth accounts for China, Japan, South Korea and the U.S. It shows inputs of capital and labor, and improvements in educational levels to measure labor and total factor productivity. Chinese factor productivity was negative in the Maoist period, and improved dramatically in the reform period 1978–2003. Japanese experience was in striking contrast. Its super-growth in 1952–78 was virtually identical with that of China in the reform period and slackened sharply thereafter. In South Korea there was a much smaller slowdown in the second period. In the U.S., performance was much slower than in China.

Colonialism in most of Asia had ended by 1950 and countries were free to follow indigenous policies to promote economic growth. However, East Asian per capita income was well below pre-war levels and the Korean war was a further impediment to recovery. Japan's empire was liquidated, and 5 million refugees were repatriated. Its GDP was below pre-war levels until 1955.

In spite of these unfavorable omens, several East Asian countries had an unparalleled surge of growth from 1952 to 1978. Per capita GDP rose faster than in Western Europe: 6.7 percent a year in Japan, 6.6 percent in Taiwan, 6.3 percent in South Korea, 5.4 percent in Hong Kong, and 4.8 percent in Singapore. They started from a low level, and rapid catch-up was achieved by large increases in capital stock, improvements in educational level, and rapid growth in exports (see the comparative growth accounts for China, Japan, the U.S. and South Korea in Table 6).

Japan was the most successful because it could switch all of its already highly educated labor force to peacetime pursuits and its international interaction benefited from its early emergence as an ally of the United States. South Korea and Taiwan also benefited in their reconstruction and rapid development from being U.S. allies and recipients of U.S. aid. Growth slowed a little after 1978 in most of these countries, but there was a marked deceleration in Japan which operated nearer to the technological frontier, and had pushed investment to a point of diminishing returns (see the Japanese capital output ratios in Table 6).

In 1952–78, per capita GDP growth in China and India was well below the Asian average. In both cases, domestic policies bore some of the responsibility. In China, the establishment of the People's Republic brought a sharp change in the political elite and mode of governance (bigger than the Meiji shakeup in 19th-century Japan). The degree of central control was much greater than under the

TABLE 6

Basic Growth Accounts, China, Japan, South Korea and the U.S. 1952–2003
(annual average compound growth rates)

	China		Japan	
	1952–78	1978–2003	1952–78	1978–2003
Population	2.02	1.20	1.10	0.41
GDP	4.39	7.85	7.86	2.53
Per capita GDP	2.33	6.57	6.69	2.11
Labor input	2.57	1.89	1.12	0.07
Education	4.49	2.63	1.19	1.12
Quality adjusted labor input	4.87	3.23	1.72	0.63
Non-residential capital	7.72	7.73	9.57	5.03
Labor productivity	1.78	5.85	6.67	2.46
Capital productivity	–3.09	0.11	–1.56	–2.39
Capital per person engaged	5.02	5.73	7.97	4.38
Total factor productivity	–1.37	2.95	3.32	0.36
Export volume	2.6	14.42	13.17	4.09
	United States		South Korea	
	1952–78	1978–2003	1952–78	1978–2003
Population	1.34	1.07	2.21	1.06
GDP	3.61	2.94	8.63	6.68
Per capita GDP	2.24	1.85	6.28	5.56
Labor input	1.12	1.10	3.40	1.75
Education	1.12	1.20	*3.13*	*3.13*
Quality adjusted labor input	1.69	1.61	5.02	2.15
Non-residential capital	3.39	3.23	10.89	10.24
Labor productivity	2.47	1.82	5.05	4.85
Capital productivity	0.22	–0.38	–2.05	–3.22
Capital per person engaged	1.85	1.81	8.77	8.05
Total factor productivity	1.28	0.69	1.48	0.93
Export volume	5.19	5.91	26.1	11.2

Source: Population and GDP for all countries from www.ggdc.net/Maddison. Hours, education and capital stock for Japan and U.S. mainly from Maddison (1995a, pp. 253–4), updated in Maddison (2007b). See also Maddison (1995b, pp. 150–6), for details of capital stock estimation for Japan and U.S.; for these two countries I assumed that non-residential structures had a life of 29 years and machinery and equipment 14 years. Korean labor input and education 1952–78 from Maddison (1998a, p. 66). Growth of Korean productive fixed capital stock 1952–78 from van Ark and Timmer (2002, pp. 239–40). Korean labor input 1978–2003 from Groningen Growth and Development Centre database; capital stock 1978–2003 from Pyo *et al.* (2006, p. 108). China employment, education and capital stock from Maddison (2007b). Labor input for Japan, Korea, and the United States refers to total hours worked, and to employment for China. Labor quality is augmented by increases in the average level of education of the working population; it was assumed that the impact on the quality of labor input was half the rate of growth of education. In calculating total factor productivity growth, labor input was given a weight of 0.65, education 0.325 and capital 0.35.

Ch'ing dynasty or the KMT. Landlords, and national and foreign capitalist interests were eliminated by expropriation of private property and there were minimal links to the world economy. The political changes had substantial costs. China's version of communism involved risky experimentation on a grand scale. Self-inflicted wounds brought the economic and political system close to collapse during the Great Leap Forward (1958–60), and again in the Cultural Revolution (1966–76) when education and the political system were deeply shaken. Allocation of resources was extremely inefficient. From 1952 to 1973 the United States applied a comprehensive embargo on trade, travel and financial transactions, and from 1960

onwards the USSR did the same. China grew more slowly than other communist economies and somewhat less than the world average. Nevertheless, economic performance was greatly improved over the past. GDP trebled; per capita real product rose by more than 80 percent. After 1978, Chinese economic performance surged at a similar pace to that attained earlier in Japan, and this surge is likely to last much longer, as China operates much further from the technical frontier.

In India, from 1952 to 1978, per capita GDP grew by 1.7 percent a year, faster than in colonial times, but below potential, because Nehruvian policies involved high levels of public investment in heavy industry and detailed controls on the private sector. The Gandhian heritage placed great emphasis on self sufficiency. These policies were modified somewhat and per capita growth rose to 2.6 percent a year in 1978–90. Policy became substantially more liberal when Manmohan Singh became Minister of Finance in 1991–96. Since 2004 he has been Prime Minister and has given a further boost to expansionist policies. He greatly reduced the degree to which economic activity was constrained by official permits and encouraged the inflow of foreign investment. As a result, per capita GDP rose by an average of 3.9 percent a year from 1990 to 2003 and accelerated to 6.5 percent in 2003–06, coming close to the growth performance of China.

Projecting GDP Growth and Level Performance from 2003 to 2030

It seems clear that the catch-up surge in Asia's two biggest economies is likely to continue, as it is based on high levels of investment in physical and human capital, increased exposure to world trade, receipt of foreign investment, and accelerated transfer of technology. In India the period of super-growth has been much shorter than in China; its levels of education are lower, its infrastructure of roads, railways, ports and electricity supply is weaker, labor market flexibility is less because of government regulations and caste barriers, and its exports are only one eighth of that of China. However, Indian per capita GDP is only half of that of China, so its catch-up potential seems very promising. Table 7 shows the steady rise in Asia's share of world income and its likely continuance to 2030 and beyond.

In Maddison (2007a, 2007b), I made projections of Chinese and world economic performance to 2030, compared the past and potential performance of five countries which constitute half of world GDP, and tried to explain why China performed so much better than Russia in 1990–2003 (see Tables 8a, 8b and 9).

(1) Chinese reformers gave first priority to agriculture. They ended Mao's collectivist follies and offered individual peasant households the opportunity to raise their income by their own efforts. Russian reformers more or less ignored agriculture as the potential for individual peasant household enterprise had been killed off by Stalin in the 1920s. The Chinese government encouraged small-scale manufacturing in township and village enterprises. Local officials and party elite had legal opportunities for greatly increasing their income if they ran the enterprises successfully.
(2) China did not disintegrate as the USSR did. The proportion of ethnic minorities is much smaller in China, and in spite of its size, China is a nation state rather than an empire. By patient diplomacy and accepting capitalist enclaves, it grew by reintegrating Hong Kong and Macao as special administrative regions.

TABLE 7
SHARES OF WORLD GDP, 1820–2030

	1820	1950	1973	2003	2030
Western Europe	23.0	26.2	25.6	19.2	13.0
U.S.	1.8	27.3	22.1	20.7	17.3
Western offshoots*	0.1	3.4	3.3	3.1	2.5
Japan	3.0	3.0	7.8	6.6	3.6
Rich	27.9	59.9	58.7	49.6	36.4
China	32.9	4.6	4.6	15.1	23.8
India	16.0	4.2	3.1	5.5	10.4
Other Asia**	7.4	6.8	8.7	13.2	15.4
Eastern Europe	3.6	3.5	3.4	1.9	1.3
former USSR	5.4	9.6	9.4	3.8	3.4
Latin America	2.1	7.8	8.7	7.7	6.3
Africa	4.5	3.8	3.4	3.2	3.0
Rest	72.1	40.1	41.3	50.4	63.6
Asia as % of world	59.3	14.9	24.2	40.5	53.3

Notes:
*Australia, Canada and New Zealand.
**Includes Bangladesh and Pakistan from 1950.
Source: Maddison (2007b).

(3) In the reform era, China benefited substantially from the great number of overseas Chinese. A large part of foreign investment and foreign entrepreneurship has come from Hong Kong, Singapore, Taiwan and Chinese in other parts of the world.
(4) China started from a very low level of productivity and income. In 1978, when the reform era began, per capita income was less than 15 percent of that in the USSR and its degree of industrialization was much smaller. If the right policies are pursued, backwardness is a favorable position for a nation which wants to achieve rapid catch-up. The very fact that the Chinese income level was so much lower than that of Hong Kong, Japan, Malaysia, South Korea, Singapore and Taiwan made it easier to capture the advantages of backwardness, and make considerable structural changes. It means that its period of super-growth can stretch further into the future than theirs.
(5) Chinese family planning policy reduced the birth rate and changed the population structure in a way that promoted economic growth. In 1978–2003 the proportion of working age rose from 54 to 70 percent. In China, life expectation has risen. In Russia it has fallen.
(6) The leadership was very sensitive to the dangers of hyper-inflation which China had experienced when the KMT were in charge. Instead of destroying private savings as in Russia, they were encouraged and have increased enormously. They are the main reason that it was possible to raise investment to such high levels. Russian shock therapy involved a period of hyper-inflation, large-scale capital flight, currency collapse and default on foreign debt. China remained internationally creditworthy and had negligible capital flight. Its tax incentives attracted large scale foreign investment, which facilitated its technological advance.

TABLE 8a

Comparative GDP Performance of China, Russia, Japan, India and the U.S., 1990–2030

	GDP Levels (billion 1990 PPP $)					China as % of:			
	Russia	Japan	China	U.S.	India	Russia	Japan	U.S.	India
1990	1,151	2,321	2,124	5,803	1,098	185	92	37	199
1991	1,093	2,399	2,264	5,792	1,112	207	94	39	204
1992	935	2,422	2,484	5,985	1,169	266	103	42	212
1993	854	2,428	2,724	6,146	1,238	319	112	44	220
1994	745	2,455	2,997	6,396	1,328	402	122	47	226
1995	715	2,504	3,450	6,558	1,426	483	138	53	242
1996	689	2,590	3,521	6,804	1,537	511	136	52	229
1997	699	2,636	3,707	7,110	1,611	530	141	52	230
1998	660	2,559	3,717	7,413	1,716	561	145	50	217
1999	704	2,555	3,961	7,746	1,820	563	155	51	218
2000	774	2,628	4,319	8,032	1,900	558	164	54	227
2001	814	2,633	4,781	8,093	2,009	587	182	59	238
2002	852	2,640	5,374	8,224	2,080	631	204	65	258
2003	914	2,686	6,188	8,431	2,257	677	230	73	274
2004	980	2,751	6,699	8,739	2,426	684	244	77	276
2005	1,043	2,803	7,269	9,008	2,645	697	259	81	275
2006	1,113	2,864	7,928	9,266	2,888	712	277	86	275
2015	1,300	3,116	12,271	11,467	4,665	944	394	107	263
2030	2,017	3,488	22,983	16,662	10,074	1,139	659	138	228

Source: 1990–2003 from www.ggdc.net/Maddison; 2015 and 2030 projections derived from Maddison (2007b).

TABLE 8b

Comparative Per Capita GDP Performance of China, Russia, Japan, India and the U.S., 1990–2030

	Per Capita GDP Levels (1990 PPP dollars)					China as % of:			
	Russia	Japan	China	U.S.	India	Russia	Japan	U.S.	India
1990	7,779	18,789	1,871	23,201	1,309	24	10	8	143
1991	7,373	19,355	1,967	22,849	1,299	27	10	9	151
1992	6,300	19,482	2,132	23,298	1,341	34	11	9	159
1993	5,752	19,478	2,312	23,616	1,390	40	12	10	166
1994	5,020	19,637	2,515	24,279	1,463	50	13	10	172
1995	4,813	19,979	2,863	24,603	1,538	59	14	12	186
1996	4,645	20,616	2,892	25,230	1,630	62	14	11	177
1997	4,717	20,929	3,013	26,052	1,680	64	14	12	179
1998	4,475	20,267	2,993	26,849	1,760	67	15	11	170
1999	4,776	20,198	3,162	27,735	1,835	66	16	11	172
2000	5,277	20,742	3,421	28,449	1,885	65	16	12	181
2001	5,573	20,749	3,759	28,395	1,963	67	18	13	191
2002	5,865	20,775	4,197	28,587	2,012	72	20	15	209
2003	6,323	21,116	4,803	29,039	2,150	76	23	17	223
2004	6,807	21,601	5,170	29,823	2,278	76	24	17	227
2005	7,270	21,999	5,578	30,458	2,448	77	25	18	228
2006	7,786	22,471	6,048	31,049	2,637	78	27	19	229
2015	9,554	24,775	8,807	35,547	3,663	88	36	25	240
2030	16,007	30,072	15,763	45,774	7,089	98	52	34	222

TABLE 9

INTENSITY OF ENERGY USE AND EMISSIONS, CHINA, U.S., AND WORLD 1973–2030 (ENERGY IN MILLION METRIC TONS OF OIL EQUIVALENT; CARBON EMISSIONS IN MILLION METRIC TONS)

	1973	1990	2003	2030
China				
Total energy use	472	880	1,409	2,630
Tons per capita	0.54	0.78	1.09	1.80
Tons/$1000 GDP	0.64	0.41	0.22	0.11
Carbon emissions	244	615	1,043	2,100
Per capita emissions	0.28	0.52	0.81	1.44
U.S.				
Total energy use	1,736	1,928	2,281	2,889
Tons per capita	8.19	7.71	7.86	7.94
Tons/$1000 GDP	0.49	0.33	0.27	0.17
Carbon emissions	1,283	1,321	1,562	1,828
Per capita emissions	6.05	5.28	5.38	5.02
World				
Total energy use	6,248	8,811	10,760	14,584
Tons per capita	1.60	1.68	1.71	1.78
Tons/$1000 GDP	0.39	0.32	0.26	0.15
Carbon emissions	4,271	5,655	6,736	8,794
Per capita emissions	1.09	1.08	1.07	1.08

Source: Primary energy consumption, 1973–2003, from International Energy Agency, *Energy Balances of OECD and Non-OECD Countries*, 2005 edition, OECD, Paris. Carbon emissions, 1990–2003, from International Energy Agency, *CO_2 Emissions from Fuel Combustion, 1971–2003*, 2005 edition, 1973 supplied by IEA. I converted CO_2 to carbon by dividing by 3.667 (the molecular weight ratio of carbon dioxide to carbon). Projections for 2030 were derived from the "alternative scenario" of IEA for that year in *World Energy Outlook 2006* (pp. 528–9, 534–5 and 552–3). I adjusted the IEA projections for 2030 by the difference between their GDP projections and mine (a downward coefficient of 0.875 for China, and 1.069 upward for the U.S.). The "alternative scenario" takes account of energy-efficiency policies countries might reasonably be expected to adopt over the projected period; IEA also show a "reference scenario" which provides a "baseline vision" of how energy demand would evolve if governments do nothing beyond their present commitments. GDP in 1990 Geary–Khamis $ and population from www.ggdc.net/Maddison.

(7) The state sector was not privatized, but waned by attrition. There are now many wealthy entrepreneurs in China and some have enjoyed official favors, but China did not create super-rich oligarchs by selling off state enterprises at knock-down prices as Russia did. In *Forbes Magazine*'s listing of the world's 100 richest billionaires in 2007, 13 were in Russia, three in Hong Kong and none in China.

(8) China has made massive strides to integrate into the world economy. It gave high priority to promotion of manufactured exports, setting up tax-free special enterprise zones near the coast. Exports were also facilitated by maintaining an undervalued currency. The rebound in the Russian economy since 1998 has been largely driven by the rise in the price of its exports of oil and natural gas. If Hong Kong is included, China is now the biggest exporter, accounting for nearly 11 percent of the world total. In 2006, exports were $1,286 billion, including Hong Kong; Germany was second with $1,126, the U.S. third with $1,038, and Japan fourth with $650 billion. Russia was seventh with $305 billion (see IMF, *International Financial Statistics*, April 2007).

Appendix 1

TABLE A.1

Derivation of 1990 Benchmark Levels of GDP in Geary–Khamis International Dollars, Five East European Countries and the USSR

	GDP in National Currency	Implicit PPP Converter	Exchange Rate	GDP in Million International $	GDP in Exchange Rate $ Million
Czechoslovakia	811,309	6.12	17.95	132,560	45,198
Hungary	1,935,459	28.89	63.206	66,990	30,621
Poland	608,347	3.12	9.5	194,920	64,037
Romania	857,180	10.678	22.43	80,277	38,216
USSR	1,033,222	0.520	1.059	1,987,995	975,658
Yugoslavia	1,113,095	8.565	11.318	129,953	98,347

Source: GDP in national currency from *International Comparison of Gross Domestic Product in Europe 1990* (United Nations Statistical Commission and ECE, Geneva and New York, 1994, p. 61). These comparisons were carried out in cooperation with the national statistical offices, with adjustments to make the coverage of the national accounts conform to the standardized national accounting system used in Western countries. Adjustments were also made to correct for lower quality of goods in the East European countries. The results were multilateralized using the EKS rather than the Geary–Khamis technique, and the PPP adjusted GDPs were expressed in Austrian schillings. The relative volume indices of GDP were converted to an approximate Geary–Khamis basis using Austrian GDP in international dollars as a bridge (*op. cit.*, p. 5). This is how the column 4 results were estimated and the implicit PPP in column 3 was derived by dividing column 1 by column 4. Exchange rates were derived from IMF, *International Financial Statistics*, except for the USSR which is from World Bank, *World Tables 1995*. Since 1990, Czechoslovakia has split into two countries, Yugoslavia into six, and the USSR into 15. For the 15 successor states of the USSR shown in Table 1, I used the PPP adjusted estimates of B. M. Bolotin who used the ICP approach (see "The Former Soviet Union as Reflected in National Accounts Statistics," in S. Hirsch, *In Search of Answers in the Post-Soviet Era*, MEMO 3, Washington DC, 1992, pp. 181–92). For the successor states of Czechoslovakia and Yugoslavia, I assumed that their proportional share in 1990 PPP adjusted GDP was the same as it was in national currency. For Bulgaria, I used the estimate in Penn World Tables, version 5.6, country 118. For Albania, I used a proxy estimate (see A. Maddison, *Monitoring the World Economy 1820–1992*, OECD, Paris, p. 217). The OECD released a comparison of the level of GDP in 1996 PPP adjusted dollars in 20 of these countries, using the EKS technique of multilateralization (see *A PPP Comparison for the NIS, 1994*, *1995 and 1996*, OECD, February 2000). These OECD estimates for the 15 Soviet successor states (when backcast to 1990) differed significantly from my estimates derived from Bolotin, but I preferred my estimates, because the Geary–Khamis approach is distinctly superior to the EKS method, and because the quality of the data was probably better in the 1990 comparison than in 1996; see Maddison (2001, p. 342) for a confrontation of my results with those of OECD (2000).

Appendix 2

An Important Incongruity in the Official Estimates of Employment

Until 1997, NBS had, in addition to the 16 branch breakdown, more aggregative employment estimates for three sectors, primary, secondary and tertiary. The figure for total employment was the same in the two tables.

In Yearbooks from 1997 onwards, there is a discrepancy between the two tables. Total employment in the three-sector table is much bigger than for the 16 sectors. In the 2006 Yearbook (pp. 128, 130), the three-sector total for 1990 (end-year) was 647.5 million and the actual total for the 16 sectors was 567.4 million; hence a discrepancy of 80.1 million. For 2002, the discrepancy had risen to 99.6 million. Instead of explaining the discrepancy, the Yearbooks disguised it by showing the same "total" for the 16-sector breakdown as for the three-sector aggregate.

The 16 sector series continues to be published, but the figures stop at the year 2002 in the last four Yearbooks. It would seem that the three-sector breakdown is derived from the sample population census (see Yue, 2005) and the 16-sector breakdown from labor force statistics, but users of the employment figures are entitled to a detailed explanation or reconciliation of the two types of estimate. They are also entitled to know why the 16-sector breakdown has been discontinued. In the present situation, meaningful measurement of labor productivity is no longer possible.

Appendix 3

TABLE A.3

Characteristics of China's 31 Provinces* in 2005

Pinyin	Population (000s)	Gross Regional Product (million yuan)	GDP Per Capita (yuan)	Wade–Giles
Beijing	15,360	688,631	44,843	Peking
Tianjin	10,430	379,762	35,452	Tientsin
Shanghai	17,780	915,418	51,486	Shanghai
Hebei	68,440	1,009,611	14,752	Hopei
Shanxi	33,520	417,952	12,469	Shansi
Nei Monggol	23,860	389,555	16,327	Inner Mongolia
Liaoning	42,200	800,901	18,979	Liaoning
Jilin	27,150	362,027	13,334	Kirin
Heilongjiang	38,180	551,150	14,436	Heilungkiang
Jiangsu	74,680	1,830,566	24,512	Kiangsu
Zhejiang	48,940	1,343,785	27,458	Chekiang
Anhui	61,140	537,512	8,791	Anhwei
Fujian	35,320	656,895	18,598	Fukien
Jiangxi	43,070	405,676	9,419	Kiangsi
Shandong	92,390	1,851,687	20,042	Shantung
Henan	93,710	1,058,742	11,298	Honan
Hubei	57,070	652,014	11,425	Hupei
Hunan	63,200	651,134	10,303	Hunan
Guangdong	91,850	2,236,654	24,351	Kwangtung
Guangxi	46,550	407,575	8,756	Kwangsi
Hainan	8,260	89,457	10,830	Hainan
Chongqing	27,970	307,049	10,978	Chungking
Sichuan	82,080	738,511	8,997	Szechwan
Guizhou	37,250	197,906	5,313	Kweichow
Yunnan	44,420	347,289	7,818	Yunnan
Tibet	2,760	25,121	9,102	Tibet
Shaanxi	37,180	367,566	9,886	Shensi
Gansu	25,920	193,398	7,461	Kansu
Qinghai	5,430	54,332	10,006	Tsinghai
Ningxia	5,950	60,610	10,187	Ninghsia
Xinjiang	20,080	260,419	12,969	Sinkiang
Total	1,306,280	18,308,480	14,016	Average

Note: *In fact, there are 22 provinces, 5 autonomous regions, and 4 municipalities.
Hong Kong and Macao are special administrative regions.

Source: Gross Regional Product in 2005, in current prices, and population on November 1, 2005 from NBS, *China Statistical Yearbook* (2006, pp. 63, 101).

Appendix 4

TABLE A.4

Maddison and World Bank GDP Per Capita Relatives in 2005

	Maddison (1990 GK $)		W. B. ICP (2005 EKS $)	
		% of U.S.		% of U.S.
U.S.	30,458	100.0	41,674	100.0
Canada	24,172	79.4	35,078	84.2
Australia	24,233	79.6	32,798	78.7
New Zealand	18,134	59.5	24,554	58.9
4 W. Offshoots	29,378	96.5	40,360	96.8
Austria	22,049	72.4	34,108	81.8
Belgium	22,131	72.7	32,077	77.0
Denmark	24,131	79.2	33,626	80.7
Finland	22,169	72.9	30,469	73.1
France	22,313	72.3	29,644	71.1
Germany	19,434	63.8	30,496	73.2
Greece	14,841	48.7	25,520	61.2
Ireland	26,604	87.3	38,058	91.3
Italy	19,303	63.4	27,750	66.6
Luxembourg	37,177	122.1	70,014	168.0
Netherlands	22,819	74.9	34,724	83.3
Norway	27,384	89.8	47,551	114.1
Portugal	14,093	46.3	20,006	48.0
Spain	18,197	59.7	27,270	65.4
Sweden	23,292	76.5	31,995	76.8
Switzerland	23,215	76.2	35,520	85.3
UK	22,438	73.7	31,580	75.8
29 W. Europe	20,614	67.7	30,137	72.3
12 E. Europe	7,204	23.7	12,260	29.4
15 Former USSR	6,264	20.6	9,646	22.4
Argentina	8,938	29.3	11,063	26.5
Brazil	5,839	19.2	8,596	20.6
Mexico	7,486	24.6	11,317	27.2
Iran	5,737	18.8	10,692	25.7
Turkey	7,699	25.3	7,786	18.7
15 West Asia	6,380	20.9	9,738	23.4
Japan	21,999	72.2	30,290	72.7
Hong Kong	27,771	91.2	35,680	85.6
Taiwan	18,858	61.9	26,069	62.6
Singapore	24,610	80.8	41,479	99.5
S. Korea	17,297	56.8	21,342	51.2
China	5,578	18.3	4,091	9.8
India	2,448	8.0	2,126	5.1
Pakistan	2,084	6.8	2,396	5.7
Indonesia	3,875	12.7	3,234	7.8
Thailand	7,878	25.9	6,869	16.5
Vietnam	2,456	8.1	2,148	5.1
11 Asia-Pacific	5,183	17.0	4,895	11.7
53 Africa	1,643	5.4	2,223	5.3

Source: Right-hand columns from World Bank (2008), *Global Purchasing Power Parities and Real Expenditure, 2005*, International Comparison Program. The 130 countries covered in the table represent about 95 percent of world GDP.

Two left-hand columns as follows:

(I) U.S., Canada, Australia, New Zealand, 29 Western Europe, Japan, South Korea, Mexico and Turkey, updates of Maddison's 1990 per capita GDP to 2005; see www.ggdc.net/Maddison and *National Accounts of OECD Countries, Vol. 1, Main Aggregates 1995–2006* (OECD, Paris, 2008, pp. 348–9).

(II) Argentina and Brazil, updates of Maddison's 2003 GDP to 2005 from ECLAC, *Statistical Yearbook* (2006, table 2.1.1.2); 2005 population from www.ggdc.net/Maddison.

(III) My total for West Asia includes 15 countries: Turkey and Israel which the World Bank includes in the OECD group, Iran which the World Bank includes in Asia/Pacific, and Palestinian territory in the West Bank and Gaza which the World Bank ignores. The other countries are Bahrain, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab republics and Yemen. I have adjusted the World Bank total for West Asia to include Iran, Israel and Turkey, and excluded Egypt which the World Bank includes in both West Asia and Africa.

(IV) India, Pakistan, Indonesia, Hong Kong, Singapore, Taiwan and Thailand updates of Maddison's website 2003 GDP to 2005 from Asian Development Bank, *Key Indicators* (2007, table 13), population from Maddison (www.ggdc.net/Maddison). China as described in text.

(V) East Europe and former USSR, updates of Maddison's 2003 website estimates for 2003 to 2005 from IMF, *World Economic Outlook*, October, 2007, see Table 1 above. Former USSR figures of World Bank exclude Turkmenistan and Uzbekistan.

(VI) Iran and West Asia updates of Maddison's website 1998 GDP to 2005 from IMF, *World Economic Outlook*, October, 2007.

(VII) IMF, *World Economic Outlook*, October 2007 (p. 219) provides estimates for 1999–2005 GDP increments in 50 African countries, and for Egypt and Libya which IMF classifies in "Middle East." Libya is ignored by the World Bank.

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