

**Shares of the Rich and the Rest in the World Economy: Income  
Divergence between Nations, 1820-2030  
by Angus Maddison**

*Summary:* This paper analyses the forces determining per capita income levels of nations over the past millennium and the prospects to 2030. In the year 1000, Asian countries were in the lead. By 1820, per capita GDP in western Europe and the US was twice the Asian average. The divergence had grown much bigger by 1950, but by the 1970s, several Asian countries—Japan, South Korea, Taiwan, Hong Kong and Singapore had achieved considerable catch-up. Since then, there has been a major surge in China and the beginning of a similar phenomenon in India. As a result, the Asian share of world income has risen steadily and by 2030, will be fairly close to what it was in 1820. I conclude by comparing my projections for 2030 with those of Goldman Sachs, Perkins and Rawski, and Fogel.

*Contact details:* [angus.maddison@wanadoo.fr](mailto:angus.maddison@wanadoo.fr), [www.ggdc.net/Maddison](http://www.ggdc.net/Maddison),  
Tel:33-34476-0532, Fax: 33-34476-6514, Chevincourt 60150, France.

**Changes in the Momentum of Growth over the Long Term (1)**

From the year 1000 to 1820, world economic growth was predominantly extensive. Most of the GDP increase went to accommodate a fourfold increase in population. The advance in per capita income was a slow crawl—the world average increased less than half over a period of eight centuries (see Table 1). In the year 1000, the countries in the group I call “Rich” (Western Europe, USA, Canada, Australia, New Zealand and Japan) had a lower income than the “Rest”, but by 1820 the situation had been reversed; the Rich had an average per capita income nearly twice as high as the Rest. Since 1820 world development has been much more dynamic. By 2003 all regions had increased their incomes, but the Rich raised their average 21 fold, the rest less than 7 fold. A six-fold gap had emerged between the income of the two groups. The divergence of average per capita income between countries within the Rich group was much smaller (less than 2:1) in 2003 than that within the Rest of the world where the difference between Hong Kong and Burundi was 50:1 (see Table 2).

**Table 1 Levels of per Capita GDP, 1000-2030 AD**  
(1990 international dollars)

	<i>1000</i>	<i>1500</i>	<i>1820</i>	<i>1950</i>	<i>1973</i>	<i>2003</i>	<i>2030</i>
Western Europe	427	772	1 202	4 578	11 417	19 912	31 389
USA	400	400	1 257	9 561	16 689	29 037	45 774
Other W. Offshoots	400	400	761	7 424	13 399	22 853	36 025
Japan	425	500	669	1 921	11 434	21 218	30 072
<b>Rich</b>	<b>425</b>	<b>703</b>	<b>1 109</b>	<b>5 648</b>	<b>13 802</b>	<b>23 345</b>	<b>37 086</b>
China	466	600	600	448	838	4 803	15 763
India	450	550	533	619	853	2 160	7 089
Other Asia	520	565	578	924	2 046	4 257	8 292
Latin America	400	416	691	2 503	4 513	5 786	8 648
E. Europe & f. USSR	400	498	686	2 602	5 731	5 705	11 214
Africa	428	416	421	890	1 410	1 549	2 027
<b>Rest</b>	<b>458</b>	<b>538</b>	<b>578</b>	<b>1 094</b>	<b>2 072</b>	<b>3 816</b>	<b>8 504</b>
<b>World</b>	<b>453</b>	<b>567</b>	<b>667</b>	<b>2 111</b>	<b>4 091</b>	<b>6 477</b>	<b>11 814</b>
Interregional Spread	1.2:1	1.9:1	3:1	21.3:1	19.9:1	18.7:1	22.6:1
Rich/Rest Spread	0.9:1	1.3:1	1.9:1	5.2:1	6.7:1	6.1:1	4.4:1

Source : [www.ggdcc.net/Maddison](http://www.ggdcc.net/Maddison)

**Table 2 Per Capita Income Divergence within the World Economy in 2003**

<i>Region</i>	<i>% of World GDP</i>	<i>Highest in 1990 PPP dollars</i>	<i>Lowest</i>	<i>Range</i>
W. Europe	19.2	Norway 26,033	Greece 13,667	1.9:1
W. Offshoots	23.7	USA 29,037	N. Zealand 17,565	1.7:1
Asia	40.5	Hong Kong 24,098	Afghanistan 688	41:1
L. America	7.7	Trinidad & Tobago 16,984	Haiti 740	21:1
Africa	3.2	Equatorial Guinea 13,562	Burundi* 477	28:1
E. Europe	1.9	Slovenia 13,995	Serbia 2,578	5.4:1
f. USSR	3.8	Estonia 14,349	Tajikistan 1,102	13:1
World	100.0	USA 29,037	Burundi* 477	61:1

\* I have ignored the estimate of \$212 for Zaire as it is subject to a wide margin of error aggravated by war conditions. The next lowest country was Burundi.

Source: [www.ggdcc.net/Maddison](http://www.ggdcc.net/Maddison)

### **Why the West grew faster than the Rest before 1820**

The greater dynamism of Western Europe than Asia before 1820 was due to five major changes which had no counterpart elsewhere.

1) The introduction of printed books in the fifteenth century, the renaissance and the development of Galileian and Newtonian science, systematic experimentation and the spread of university education unleashed a Promethean advance of secular knowledge which was a fundamental prerequisite for later technological development.

2) In the eleventh and twelfth centuries, important urban trading centres emerged in Flanders and Northern Italy with autonomous property rights. This fostered entrepreneurship and abrogated feudal constraints on the purchase and sale of property. Development of accountancy helped make contracts enforceable. New financial and banking institutions provided access to credit and insurance, facilitated risk assessment and large scale business organisation throughout Western Europe.

3) The influence of the Christian church meant that marriage was monogamous, with a ban on concubinage, adoption, divorce, remarriage of widows or widowers. Inheritance was limited to close family members and widespread adoption of primogeniture broke down loyalties to clan, tribe or caste, promoted individualism and accumulation, and reinforced the sense of belonging to a nation state. This contrasted with the polygamy of the Islamic world and the extended family systems of India and China.

4) A fourth distinctive feature was the emergence of nation-states in close propinquity, with significant trading relations and relatively easy intellectual interchange in spite of linguistic differences. This benign fragmentation stimulated competition and innovation. Migration to or refuge in a different culture and environment were options open to adventurous and innovative minds. For this reason, the pace of economic advance was fairly congruent within western Europe.

5) Advances in maritime technology and navigation techniques revolutionised European knowledge of world geography. The discovery of the Americas, new routes around Africa to Asia, and Magellan's circumnavigation of the globe led to the development of merchant capitalism and colonialism with global horizons. The economy of the Americas was transformed, and repopulated by slaves and European settlers. There were also substantial profits from trade with Asia.

### **Why the divergence between the West and Rest continued in the capitalist era from 1820 to 1950**

After 1820, economic growth accelerated in western Europe for two reasons; the leading countries had acquired most of the institutional and intellectual attributes of a modern capitalist state, and the faster pace of technical change required new elements of dynamism. Table 3 shows the proximate driving forces which emerged in five successive phases of capitalist development in the UK, the USA, and Japan (the only Asian country to develop an early catch-up strategy). Accelerated GDP growth needed big increases in the capital stock, in the education level of the labour force, and a rapid expansion of international trade. These characteristics were missing in most of Asia until after the second world war.

Western European countries had lost most of their American colonies by 1820, but augmented their imperialist ambitions in Asia and subsequently in Africa. Merchant capitalist policies had generally been beggar-your-neighbour, but imperialism became much more collusive in the nineteenth century, (especially so in China). Generally, the imperialist powers avoided conflict with each other. From 1820 to until the outbreak of the second world war, western powers regarded colonialism as a significant contribution to their prosperity, but nationalist politicians in the colonised countries, notably in China, India and Indonesia, rightly considered colonial policy a major barrier to their economic performance.

**Table 3a Determinants of Growth: UK, USA and Japan, 1820-2003**

	UK	USA	Japan	UK	USA	Japan
	<b>Gross Stock of Machinery and Equipment</b>			<b>Gross Stock of Non-Residential Structures Per</b>		
	<b>Per Capita(1990\$)</b>			<b>Capita (1990 \$)</b>		
1820	92	87	n. a.	1,074	1,094	n. a.
1870	334	489	94a	2,509	3,686	593a
1913	878	2,749	329	3,215	14,696	852
1950	2,122	6,110	1,381	3,412	17,211	1,929
1973	6,203	10,762	6,431	9,585	24,366	12,778
2003	14,291	32,240	31,232	22,957	35,687	52,589
	<b>Primary Energy Consumption Per Capita</b>			<b>Average Years of Education Per Person</b>		
	<b>(tons of oil equiv.)</b>			<b>Employed*</b>		
1820	.61	2.49	0.20	2.00	1.75	1.50
1870	2.21	2.45	0.20	4.44	3.92	1.50
1913	3.24	4.47	0.42	8.82	7.86	5.36
1950	3.14	5.68	0.54	10.60	11.27	9.11
1973	3.93	8.19	2.98	11.66	14.58	12.09
2003	3.86	7.86	4.05	15.79	20.77	16.78
	<b>Land Area Per Capita (hectares)</b>			<b>Exports Per Capita (1990 \$)</b>		
1820	1.48	48.1	1.23	53	25	0
1870	1.00	23.4	1.11	390	62	2
1913	0.69	9.6	0.74	862	197	33
1950	0.48	6.2	0.44	781	283	42
1973	0.43	4.4	0.35	1,684	824	875
2003	0.41	3.2	0.30	5,342	2,762	3,152
	<b>Hours Worked Per Head of Population</b>			<b>GDP Per Hour Worked (1990 \$)</b>		
1820	1,153	968	1,598	1.49	1.30	0.42
1870	1,251	1,084	1,598	2.55	2.25	0.46

1913	1,181	1,036	1,290	4.31	5.12	1.08
1950	904	756	925	7.93	12.65	2.08
1973	750	704	988	15.97	23.72	11.57
2003	694	746	853	30.69	38.92	24.86

a)1890; \* equivalent years of primary education.

**Table 3b Capital/Output Ratios, Labour and Total Factor Productivity:  
UK, USA and Japan, 1820-2003**

	UK	USA	Japan	UK	USA	Japan
	<b>Capital-Output Ratio Machinery &amp; Equipment/GDP</b>			<b>Capital-Output Ratio Non-Residential Structures/GDP</b>		
1820	.05	.07	n.a.	.63	.87	n. a.
1870	.11	.20	.10a	.79	1.51	.59a
1913	.18	.52	.24	.65	2.77	.61
1950	.31	.64	.72	.49	1.80	1.00
1973	.52	.64	.93	.80	1.46	1.12
2003	.67	1.11	1.47	1.08	1.23	2.48
	<b>Labour Productivity</b>			<b>Total Factor Productivity</b>		
	<b>(annual average compound growth rates)</b>					
1820-1870	1.10	1.10	0.18	0.15	-0.15	n. a.
1870-1913	1.22	1.93	2.00	0.31	0.36	-0.21b
1913-1950	1.66	2.47	1.79	0.81	1.62	0.20
1950-1973	3.09	2.77	7.75	1.48	1.75	5.12
1973-2003	2.20	1.66	2.58	0.91	0.65	0.63
a) 1890; b) 1890-1913						

Source: Maddison, 2007a , pp 305-6.

### **Western Europe's Postwar Golden Age**

From 1950 to 1973, west European per capita GDP grew more than 4 per cent a year, three times as fast as in any earlier phase of development. There was a potential for catch-up due to prewar stagnation and wartime destruction. The east-west split reinforced harmony of interests between the capitalist economies. The policy conflicts of pre-war years did not recur. The US played a generous and effective role from 1948, providing a substantial flow of Marshall aid, fostering liberal trading policies, creating a functioning international order with explicit and rational codes of behaviour, and institutions for cooperation. West European governments gave much greater

emphasis to economic growth objectives than ever in the past, and were meticulous in measuring performance. They promoted high levels of demand and employment and openness to international trade. The productivity gap within the western world was significantly reduced. After 1973, average per capita growth in Western Europe was similar to that in the US, the catch-up phase had ended in most of countries, but the slowdown was warranted as they now operate much closer to the frontier of technology. The success of growth policies reduced the appeal of imperialism. Prewar policies of colonial tutelege were abandoned and emphasis switched to stimulating development by providing financial aid.

### **The End of Colonialism in Asia, and the beginning of indigenous policies for catch up.**

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 prewar levels and the Korean war was a further impediment to recovery. Japan's empire was liquidated, and five million refugees were repatriated. Its GDP was below prewar levels until 1955.

**Table 4 Basic Growth Accounts, China, Japan, South Korea and the USA, 1952-2003**  
(annual average compound growth rates)

	<b>China</b>		<b>Japan</b>	
	<i>1952-78</i>	<i>1978-2003</i>	<i>1952-78</i>	<i>1978-2003</i>
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
Labour Input	2.57	1.89	1.12	0.07
Education	4.49	2.63	1.19	1.12
Quality adjusted labour input	4.87	3.23	1.72	0.63
Non-Residential Capital	7.72	7.73	9.57	5.03
Labour 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
	<b>United States</b>		<b>South Korea</b>	
	<i>1952-78</i>	<i>1978-2003</i>	<i>1952-78</i>	<i>1978-2003</i>
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
Labour Input	1.12	1.10	3.40	1.75
Education	1.12	1.20	3.13	3.13
Quality adjusted labour input	1.69	1.61	5.02	2.15
Non-Residential Capital	3.39	3.23	10.89	10.24
Labour 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: Maddison, 2007b, p. 68.

In spite of these unfavourable 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% a year in Japan, **6.6% in Taiwan**, 6.3% in South Korea 5.4% in Hong Kong, and 4.8% 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 USA and South Korea in Table 4).

Japan was the most successful because it could switch all of its already highly educated labour force to peacetime pursuits and its international interaction benefitted from its early emergence as an ally of the United States. South Korea and Taiwan also benefitted in their reconstruction and rapid development from being US allies and recipients of US 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 3 b).

### **The Asian surge spreads to China and India**

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 nineteenth century Japan). The degree of central control was much greater than under the Ch'ing dynasty or the KMT. Landlords, 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 a great improvement over the past. GDP trebled, per capita real product rose by more than 80 per cent. 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 per cent 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 per cent 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 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 per cent a year from 1990 to 2003 and accelerated to 6.5 per cent in 2003-2006, coming close to the growth performance of China.

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; labour market flexibility is less because of government regulations and caste barriers, and its exports are only one eighth of Chinese. However, Indian per capita GDP is only half of that of China, so its catch-up potential seems very promising. Table 5 shows the steady rise in Asia's share of world income and its likely continuence to 2030 and beyond.

**Table 5 Shares of World GDP, 1820-2030**

	<i>1820</i>	<i>1950</i>	<i>1973</i>	<i>2003</i>	<i>2030</i>
Western Europe	23.0	26.2	25.6	19.2	13.0
USA	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
<b>Rich</b>	<b>27.9</b>	<b>59.9</b>	<b>58.7</b>	<b>49.6</b>	<b>36.4</b>
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
<b>Rest</b>	<b>72.1</b>	<b>40.1</b>	<b>41.3</b>	<b>50.4</b>	<b>63.6</b>
<b>Asia as % of World</b>	<b>59.3</b>	<b>14.9</b>	<b>24.2</b>	<b>40.5</b>	<b>53.3</b>

- Australia, Canada and New Zealand; \*\* includes Bangladesh & Pakistan from 1950

Source: Maddison (2007a)

### The Prospects for the World Economy in 2030

As there has been such a striking divergence in the pace and pattern of growth in different regions of the world in the past 30 years, it is worth considering the changes which seem likely in the next quarter century. We should keep in mind that futurology is a more speculative business than history. Hard evidence is lacking and we have to project trends from the past which seem plausible but may well be reversed by unforeseeable events.

The projections have two components: growth of population and per capita GDP. The GDP projection is derivative. I assumed that world development will not be interrupted by major military conflicts in addition to those already under way.

### Projections of Population and Changes in Demographic Characteristics

Table 6 shows the population projections to 2030 in historical perspective. They were made by the International Programs Department, US Bureau of the Census ([www.census.gov/ipc](http://www.census.gov/ipc)).

Table 6 **Population of the World and Major Regions, 1950-2030**

	Population Levels (million)					Average annual rate of change	
	1950	1973	1990	2003	2030	1990-2003	2003-2030
W Europe	305	359	378	395	400	0.33	0.05
USA	152	212	250	290	364	1.15	0.84
*Other W. O.	24	39	48	56	67	1.15	0.70
Japan	84	109	124	127	116	0.23	-0.33
<b>"Rich"</b>	<b>565</b>	<b>718</b>	<b>800</b>	<b>868</b>	<b>947</b>	<b>0.63</b>	<b>0.32</b>
E Europe	88	110	122	121	115	-0.02	-0.21
Russia	102	133	148	145	126	-0.18	-0.49
Other f USSR	78	117	141	143	161	0.13	0.43
Lat. America	166	308	442	541	702	1.58	0.97
China	547	882	1,135	1,288	1,458	0.98	0.46
India	359	580	839	1,050	1,421	1.74	1.13
Other Asia	393	678	1,007	1,269	1,795	1.79	1.29
Africa	228	390	625	853	1,449	2.43	1.98
<b>"Rest"</b>	<b>1,960</b>	<b>3,198</b>	<b>4,458</b>	<b>5,411</b>	<b>7,227</b>	<b>1.50</b>	<b>1.08</b>
<b>World</b>	<b>2,526</b>	<b>3,916</b>	<b>5,257</b>	<b>6,279</b>	<b>8,175</b>	<b>1.37</b>	<b>0.98</b>

“Other Western Offshoots” refers to Australia, Canada & New Zealand.

“Latin America” includes Caribbean countries.

**Source:** [www.ggdc.net/Maddison](http://www.ggdc.net/Maddison) shows detail for all 224 component countries annually from 1950 to 2008 and for 2030. The alternative projections of the United Nations are

not significantly different, see the “medium variant” of the UN Population Division, *World Population Prospects, 2004 Revision*, New York, 2005. It projects world population in 2030 of 8,199 million, 961 million for the “Rich” and 7,238 million for the “Rest”.

**Table 7 Per Capita GDP: the World and Major Regions 1950-2030**

	Level in 1990 international PPP \$					Average annual rate of change	
	1950	1973	1990	2003	2030	1990-2003	2003-2030
W Europe	4,578	11,417	15,965	19,912	31,389	1.71	1.7
USA	9,561	16,689	23,201	29,037	45,774	1.74	1.7
Other W. O.	7,424	13,399	17,902	22,853	36,025	1.90	1.7
Japan	1,921	11,434	18,789	21,218	30,072	0.94	1.3
<b>“Rich”</b>	<b>5,648</b>	<b>13,082</b>	<b>18,781</b>	<b>23,345</b>	<b>37,086</b>	<b>1.69</b>	<b>1.73</b>
E Europe	2,111	4,988	5,440	6,476	11,054	1.35	2.0
Russia	3,086	6,582	7,779	6,323	16,007	-1.58	3.5
Other f USSR	2,520	5,468	5,954	4,461	7,614	-2.20	2.0
Latin America	2,503	4,513	5,072	5,786	8,648	1.02	1.5
China	448	838	1,871	4,803	15,763	7.52	4.5
India	619	853	1,309	2,160	7,089	3.93	4.5
Other Asia	924	2,046	3,078	4,257	8,292	2.53	2.5
Africa	890	1,410	1,449	1,549	2,027	0.52	1.0
<b>"Rest"</b>	<b>1,094</b>	<b>2,072</b>	<b>2,718</b>	<b>3,816</b>	<b>8,504</b>	<b>2.64</b>	<b>3.01</b>
<b>World</b>	<b>2,113</b>	<b>4,091</b>	<b>5,162</b>	<b>6,516</b>	<b>11,814</b>	<b>1.81</b>	<b>2.23</b>

**Table 8 Growth of GDP : the World and Major Regions, 1950-2030**

	Levels in billion 1990 PPP dollars					Average annual rate of change	
	1950	1973	1990	2003	2030	1990-2003	2003-2030
W Europe	1,396	4,097	6,033	7,857	12,556	2.05	1.75
USA	1,456	3,537	5,803	8,431	16,662	2.91	2.56
Other W.Offs.	180	522	862	1,277	2,414	3.07	2.39
Japan	161	1,243	2,321	2,699	3,488	1.17	0.95
<b>"Rich"</b>	<b>3,193</b>	<b>9,398</b>	<b>15,020</b>	<b>20,265</b>	<b>35,120</b>	<b>2.33</b>	<b>2.06</b>
E Europe	185	551	663	786	1,269	1.33	1.79
Russia	315	872	1,151	914	2,017	-1.76	2.98
Other f USSR	196	641	837	638	1,222	-2.17	2.43
Latin America	416	1,389	2,240	3,132	6,074	2.61	2.48
China	245	739	2,124	6,188	22,983	8.56	4.98
India	222	495	1,098	2,267	10,074	5.73	5.68
Other Asia	363	1,387	3,099	5,401	14,884	4.36	3.83
Africa	203	550	905	1,322	2,937	2.96	3.00
<b>"Rest"</b>	<b>2,144</b>	<b>6,625</b>	<b>12,117</b>	<b>20,649</b>	<b>61,460</b>	<b>4.19</b>	<b>4.12</b>
<b>World</b>	<b>5,337</b>	<b>16,023</b>	<b>27,136</b>	<b>40,913</b>	<b>96,580</b>	<b>3.21</b>	<b>3.23</b>

### **Assumptions Underlying the Projections of per capita GDP**

For population the USBC made individual projections for 224 countries, see [www.ggdc.net/Maddison](http://www.ggdc.net/Maddison). My projections of per capita GDP are much more aggregative. They cover seven major regions, the four countries with the biggest shares of world GDP and Russia. They are not the result of an econometric exercise, but are based on an analysis of changes in the momentum of growth in different parts of the world economy, and my assessment of the likelihood of their continuation or change. They were conceived as likely continuation or deviation from the momentum of growth in 1990-2003 (2).

#### ***The Rich Country Group***

For the advanced capitalist group, i.e. western Europe, the USA, the other western offshoots and Japan, their aggregate per capita GDP is assumed to advance at the same pace as in 1990-2003. This does not mean that all component countries will have the same growth rate. The rapid and widespread catch-up on US per capita income levels in the golden age (1950-73) had ended for most countries by the 1990s. France, Germany, Italy and Japan advanced more slowly than the USA in 1990-2003, but Ireland made a remarkable bound forward, while Australia, Spain and the UK had a respectable degree of catch-up. Labour input per head of population is generally lower in western Europe than in the USA, so the gap in performance is smaller in terms of productivity than in per capita GDP. This is due in part to shorter working hours and longer holidays, but in France, Germany and Italy unemployment rates were much higher than in the USA and UK from 1990 to 2003. This contrasts with the situation in the golden age, when European unemployment rates were much lower than in the USA. With more flexible labour market policies there would be some scope for better European performance (see van Ark, 2006 and Gordon, 2006).

#### **Asia**

In the past three decades, the biggest change in the structure of the world economy was the increased share of Asia, which is likely to continue. China has been the most dynamic of the Asian economies, but growth will probably decelerate for several reasons. In the reform period, the emphasis on population control and changes in age structure made it possible to raise the activity rate to a degree that cannot be repeated. Because of the low starting point, the average educational level of the labour force was multiplied by a factor of six from 1952 to 2003. China has suffered environmental deterioration in its push for rapid growth. In future it will have to devote greater resources to mitigate this damage.

Income growth has lagged in rural areas and there has been a neglect of rural educational and health facilities. Bigger resources will be needed to compensate for this. Some slowdown can also be expected as Chinese wages rise and the average technological level gets closer to the frontier in the advanced countries. I assumed that per capita income will grow at an average rate of 4.5 per cent a year between 2003 and 2030, but that the rate of advance will taper off. Specifically, I assume a rate of 5.6 per cent a year to 2010, 4.6 percent between 2010 and 2020, and a little more than 3.6 per cent a year from 2020 to 2030. By then, it will have reached the same per capita level as western Europe in 1990. As it approaches this level, technical advance will be more costly as imitation is replaced by innovation. Even on my rather conservative assumptions, China would again become the world's biggest economy by 2015, the USA would be number two and India number three. The average per capita income level in China would still be a good deal lower than in the USA, western Europe and Japan, but it would be well above the world average.

**Table 10 Ranking of the 20 Biggest Countries in 2003 and 2030**

	2030			2003		
	<i>GDP billion 1990 PPP dollars</i>	<i>Population million</i>	<i>per capita GDP 1990 PPP \$</i>	<i>GDP billion 1990 PPP dollars</i>	<i>Population million</i>	<i>per capita GDP 1990 PPP \$</i>
China	22,983	1,458	15,763	6,188	1,288	4,803
USA	16,662	364	45,774	8,431	290	29,037
India	10,074	1,421	7,089	2,267	1,050	2,160
Japan	3,488	116	30,072	2,699	127	21,218
Germany	2,406	80	30,179	1,577	82	19,144
France	2,171	63	34,462	1,316	60	21,861
UK	2,150	64	33,593	1,281	60	21,310
Russia	2,017	126	16,007	914	145	6,323
Indonesia	1,973	285	6,924	763	214	3,555
Brazil	1,853	223	8,316	1,013	182	5,563
Italy	1,686	55	30,661	1,111	58	19,450
S. Korea	1,532	50	30,643	758	48	15,732
Mexico	1,442	135	10,668	740	104	7,137
Canada	1,429	39	36,629	748	32	23,236
Turkey	1,101	84	13,111	458	68	6,731
Spain	1,046	39	26,832	685	40	17,021
Thailand	995	71	14,014	455	63	7,195
Iran	928	86	10,789	372	67	5,539
Australia	844	23	36,710	460	20	23,287
Taiwan	842	25	33,666	391	23	17,284
<b>Total 20</b>	<b>77,722</b>	<b>4,806</b>	<b>16,172</b>	<b>29,577</b>	<b>4,003</b>	<b>7,394</b>
<b>World</b>	<b>96,580</b>	<b>8,175</b>	<b>11,814</b>	<b>40,913</b>	<b>6,279</b>	<b>6,516</b>
<b>20 as % of Total</b>	<b>80.5</b>	<b>58.8</b>	<b>136.9</b>	<b>72.3</b>	<b>63.8</b>	<b>113.5</b>

### **Comparison of Maddison Projections of Asian Performance in 2030 with those of Goldman Sachs (2003), Perkins and Rawski (2007), and Robert Fogel (2007)**

My projections of Chinese and Indian growth are based on a careful scrutiny of catch-up surges elsewhere over the past six decades. All of these have slackened off or, in the Japanese case, stopped, as these countries approached the technological frontier (see Figure 1). This historical perspective is probably the reason why my projections are more conservative than the others cited here. Goldman Sachs projections are for 2000-2050 for four catch-up countries, Brazil, China, India and Russia compared with expected performance in the USA, UK, Japan and western Europe. In the benchmark estimates for 2000, GDP in national currencies is converted to US dollars at exchange rates, rather than PPP (purchasing power parity). GDP growth is projected for every year in real terms, and Goldman Sachs also assume that the initial exchange rates of the catch-up countries will gradually converge to something like a PPP level. Here I ignore this second component and use their “real growth” estimates on p. 21. Their population estimates are the same as mine. For China they project gradually decelerating per capita GDP growth which averages 5 per cent a year for 2003-2030. This compares with my 4.5 per cent average. Using my numeraire (1990 Geary Khamis PPP dollars) they project a per capita level of \$17,964 compared with my \$15,783. For India, they project a wobbly but fairly stable growth rate of per capita GDP, which averages 4.67 per cent a year, compared to my 4.5 per cent. Their population estimates are the same as mine. Using my numeraire, they project a per capita GDP level of \$7,422 in 2030 for India, compared to my \$7,089. The Goldman Sachs estimates seem reasonable; their gradual deceleration for China is also a feature of my procedure, as is their China/India differential. They are more optimistic than I am but the margin of difference is not worth contesting.

Perkins and Rawski are concerned only with China for the period 2005-2025. They use a detailed set of growth accounts to illuminate their judgement. They revise the official Chinese estimates of past GDP growth (see their Table A1) very slightly, from 9.6 to 9.4 per cent a year for 1978-2003. My own much more detailed adjustment is considerably bigger, and shows growth of 7.9 per cent a year. They consider two growth paths, one near to past performance, with 9 percent annual GDP growth, which they reject as implausible, and they opt for a lower rate of 6 per cent (they do not taper this rate as I and Goldman Sachs do). For 2005-2025. Their population estimates are virtually the same as mine (0.5 per cent), and their per capita growth is projected to be 5.5 per cent a year (compared with my 4.7 per cent

a year for this period). Hence they project somewhat faster growth than Goldman Sachs and myself. I think their view of the past may have given their projections some upward bias, but they clearly expect growth to decelerate as China moves closer to the technological frontier.

Fogel's projections are for the period 2000 to 2040, and are comparative. They include China, India, Japan, USA, the EU, a group of 6 Asian countries and the world. His benchmark estimates are for the year 2000 in 2000 PPP dollars, though the provenance of the PPPs is not shown. For China he projects a per capita growth rate of 8.2 per cent over 40 years, giving a per capita income of \$85,000 in 2040, more than twice what he projects for the EU. Interpolating his estimate, and using my numeraire, gives a per capita GDP of \$36,490 for 2030, compared with my \$15,763. For India, he projects a per capita growth of 6 per cent compared to my 4.5 per cent. Using my numeraire, his per capita level for India in 2030 would be \$10,705 compared to my \$7,089. The Fogel estimate for China seems quite implausible. It projects the already inflated official Chinese estimate of per capita GDP growth for 1978-2003 four decades forward, with no tapering off as China gets very near the technological frontier. The estimate for India is not so egregious.

#### Endnotes

(1) It is generally recognised that cross-country comparisons of economic growth require measures that exclude the impact of inter-temporal price change. It is sometimes forgotten that inter-country comparisons of GDP level need adjustment for differences in price level. For this purpose, exchange rates are misleading and purchasing power parity (PPP) converters must be used. When these are available, time series for economic growth can be merged with the cross-country estimates of GDP levels to make a coherent set of space-time comparisons. In this paper, all cross-country comparisons are made using 1990 Geary-Khamis PPPs. Table 11 shows how far they deviate from exchange rates.

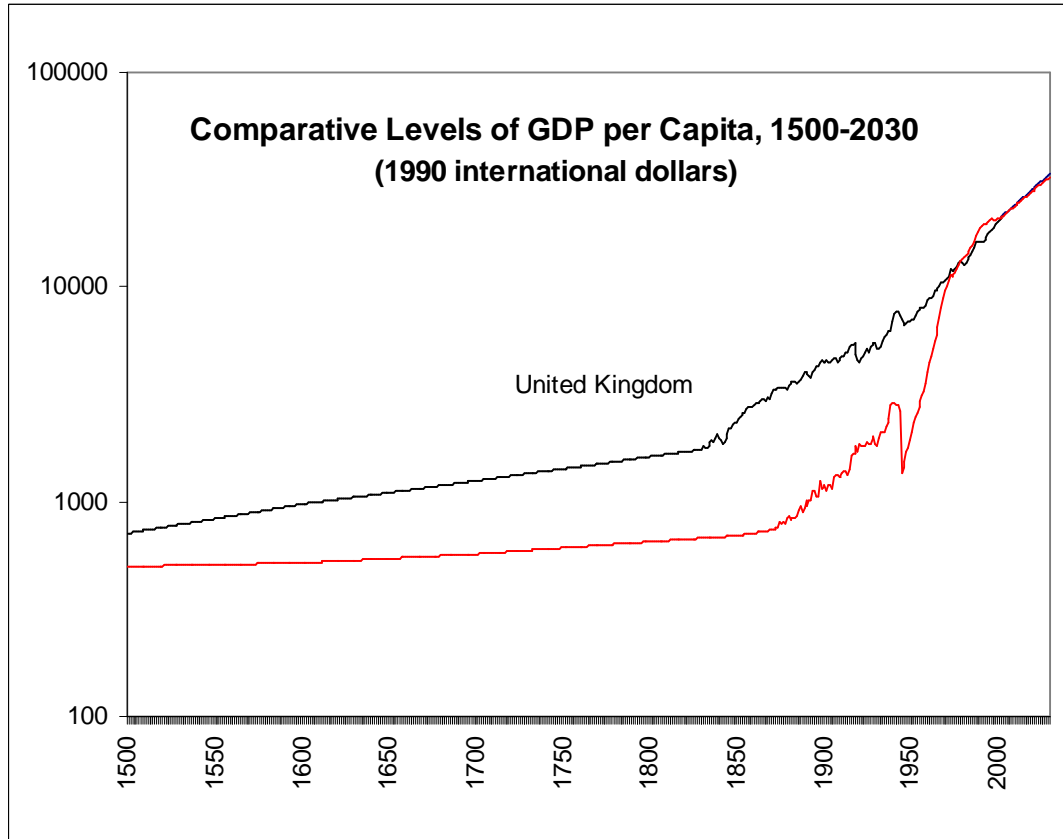
**Table 11 1990 Exchange Rates, Geary-Khamis PPPs & ER/PPP Deviations**

	(units of national currency per US \$)		
	<i>Exchange Rate</i>	<i>PPP</i>	<i>ER/PPP</i>
USA	1.0000	1.0000	1.0000
China	4.7832	0.9273	5.1580
Japan	144.7900	185.2700	0.7815
India	17.5040	4.667	3.7506
Germany	1.6160	2.0520	0.7875
France	5.4450	6.4500	0.8442
UK	0.5630	0.5870	0.9591
Italy	1,198.1000	1,384.1100	0.8656
Russia	1.0590	0.5200	2.0365

Source: Maddison (1995), pp 172 & 178; Maddison (2001), pp. 190 and 219 for Russia and China

(2) Here I have concentrated on prospects for the Rich nations and Asian countries; for an analysis of prospects for Russia and other former communist countries, for Latin America and Africa, see Maddison (2007a) chapter 7.

**Figure1 Japanese Catch-up and Slowdown**



### **Comparison of Maddison Projections of Asian Performance in 2030 with those of Goldman Sachs (2003), Perkins and Rawski (2007), and Robert Fogel (2007)**

My projections of Chinese and Indian growth are based on a careful scrutiny of catch-up surges elsewhere over the past six decades. All of these have slackened off or, in the Japanese case, stopped, as these countries approached the technological frontier (see Figure 1). This historical perspective is probably the reason why my projections are more conservative than the others cited here.

Goldman Sachs projections are for 2000-2050 for four catch-up countries, Brazil, China, India and Russia compared with expected performance in the USA, UK, Japan and western Europe. In the benchmark estimates for 2000, GDP in national currencies is converted to US dollars at exchange rates, rather than PPP (purchasing power parity). GDP growth is projected for every year in real terms, and Goldman Sachs also assume that the initial exchange rates of the catch-up countries will gradually converge to something like a PPP level. Here I ignore this second component and use their “real growth” estimates on p. 21. Their population estimates are the same as mine. For China they project gradually decelerating per capita GDP growth which averages 5 per cent a year for 2003-2030. This compares with my 4.5 per cent average. Using my numeraire (1990 Geary Khamis PPP dollars) they project a per capita level of \$17,964 compared with my \$15,783. For India, they project a wobbly but fairly stable growth rate of per capita GDP, which averages 4.67 per cent a year, compared to my 4.5 per cent. Their population estimates are the same as mine. Using my numeraire, they project a per capita GDP level of \$7,422 in 2030 for India, compared to my \$7,089. The Goldman Sachs estimates seem reasonable; their gradual deceleration for China is also a feature of my procedure, as is their China/India differential. They are more optimistic than I am but the margin of difference is not worth contesting.

Perkins and Rawski are concerned only with China for the period 2005-2025. They use a detailed set of growth accounts to illuminate their judgement. They revise the official Chinese estimates of past GDP growth (see their Table A1) very slightly, from 9.6 to 9.4 per cent a year for 1978-2003. My own much more detailed adjustment is considerably bigger, and shows growth of 7.9 per cent a year. They consider two growth paths, one near to past performance, with 9 percent annual GDP growth, which they reject as implausible, and they opt for a lower rate of 6 per cent (they do not taper this rate as I and Goldman Sachs do). For 2005-2025. Their population estimates are virtually the same as mine (0.5 per cent), and their per capita



growth is projected to be 5.5 per cent a year (compared with my 4.7 per cent a year for this period). Hence they project somewhat faster growth than Goldman Sachs and myself. I think their view of the past may have given their projections some upward bias, but they clearly expect growth to decelerate as China moves closer to the technological frontier.

Fogel's projections are for the period 2000 to 2040, and are comparative. They include China, India, Japan, USA, the EU, a group of 6 Asian countries and the world. His benchmark estimates are for the year 2000 in 2000 PPP dollars, though the provenance of the PPPs is not shown. For China he projects a per capita growth rate of 8.2 per cent over 40 years, giving a per capita income of \$85,000 in 2040, more than twice what he projects for the EU. Interpolating his estimate, and using my numeraire, gives a per capita GDP of \$36,490 for 2030, compared with my \$15,763. For India, he projects a per capita growth of 6 per cent compared to my 4.5 per cent. Using my numeraire, his per capita level for India in 2030 would be \$10,705 compared to my \$7,089. The Fogel estimate for China seems quite implausible. It projects the already inflated official Chinese estimate of per capita GDP growth for 1978-2003 four decades forward, with no tapering off as China gets very near the technological frontier. The estimate for India is not so egregious.

### **Bibliography**

- Bardhan, P. (2006), "Awakening Giants, Feet of Clay, A comparative Assessment of the Rise of China and India", *Journal of South Asian Development*, No.1,1.
- Fogel, R. (2007), "Capitalism & Democracy in 2040", *Daedalus, Journal of the American Academy of Arts & Sciences*, Summer, pp.67-95
- Garnaut, R. (2006), "Driving Forces in Chinese Growth since 1978 and the Outlook to 2030", paper presented to Seminar on World Economic Performance; Past, Present and Future, Queensland University, Brisbane, December 5-6<sup>th</sup>.
- Goldman Sachs (2003), *Dreaming with BRICS: the Path to 2050*", Global Economics Paper, no. 99, New York
- Gordon, R. J. (2006), "Future US Productivity Growth: Looking Ahead by Looking Back", ", paper presented to workshop on World Economic Performance; Past, Present and Future' University of Groningen, October 27.
- Lal, D. (2006), "Driving forces behind the acceleration of Indian Growth and the Outlook to 2030", paper presented to Seminar on World Economic Performance; Past, Present and Future, Queensland University, Brisbane, December 5-6<sup>th</sup>.
- Lin, J. Y. (2006), "Needham Puzzle, Weber Question and China's Miracle: Long term Performance since the Sung Dynasty", paper presented to Seminar on World Economic Performance; Past, Present and Future, Queensland University, Brisbane, December 5-6.
- Maddison, A. (1995), *Monitoring the World Economy, 1820-1992*, OECD, Paris.
- Maddison, A. (2001), *The World economy: A Millennial Perspective*, OECD, Paris.

- Maddison, A. (2005), “Measuring and Interpreting World Economic Performance, 1500-2001” *Review of Income and Wealth*, March, pp.1-36.
- Maddison, A. (2007a ), *Contours of the World Economy, 1-2030 AD: Essays in Macroeconomic History*, Oxford University Press.
- Maddison, A. (2007b), *Chinese Economic Performance in the Long Run, 960-2030 AD*, OECD, Paris.
- Maddison, A. and H. X. Wu (2007), “China’s Economic Performance: How Fast has GDP Grown. How Big is it compared with the USA?”, paper presented at Beijing conference on Measuring Income and Wealth in Transition Economies.
- Menshikov, S. M. (2006), “Analysis of Russian Performance since 1990 and Future Outlook”, paper presented to workshop on World Economic Performance; Past, Present and Future, University of Groningen, October 27.
- Menshikov, S. M. (2007), *The Anatomy of Russian Capitalism*, EIR News Service, Washington DC.
- Perkins, D. H. and T. C. Rawski (2007), “Forecasting China’s Economic Growth over the Next Two Decades”chapter 20 in Brandt, L.and Y. G. Rawski, (eds.), *China’s Great Transformation*, Cambridge University Press.
- van Ark, B. (2006), “Europe’s Productivity Gap: Catching Up or Getting Stuck”, paper presented to workshop on World Economic Performance; Past, Present and Future’ University of Groningen, October 27.
- Papers by Garnaut, Gordon, Lal, Lin, Menshikov, van Ark, Maddison and Wu can be found on [www.ggdc.net/Maddison/](http://www.ggdc.net/Maddison/)

**Table 12 Asian Per Capita GDP, 1820-2003 (1990 Geary-Khamis \$)**

	<b>1820</b>	<b>1870</b>	<b>1913</b>	<b>1950</b>	<b>1973</b>	<b>1990</b>	<b>2003</b>
China	600	530	552	448	838	1,871	4,803
India	533	533	673	619	853	1,309	2,160
Indonesia	612	654	904	840	1,504	2,526	3,555
Japan	669	737	1,387	1,921	11,434	18,789	21,218
Philippines	584	624	988	1,070	1,964	2,224	2,536
South Korea	600	604	869	854	2,824	8,704	15,732
Thailand	570	608	841	817	1,874	4,633	7,195
Taiwan	550	550	747	924	4,091	9,886	17,284
Bangladesh				540	497	640	939
Burma	504	504	685	396	628	778	1,896
Hong Kong	600	683	1,279	2,218	7,105	17,541	24,098
Malaysia	603	663	900	1,559	2,560	5,132	8,468
Nepal	397	397	539	496	622	808	1,007
Pakistan				643	954	1,589	1,881
Singapore	500	682	1,279	2,219	5,977	14,220	21,530
Sri Lanka	550	851	1,234	1,253	1,504	2,448	3,839
<b>average 16 Asia</b>	<b>580</b>	<b>549</b>	<b>679</b>	<b>668</b>	<b>1,568</b>	<b>2,707</b>	<b>4,459</b>
Afghanistan				645	684	604	668
Cambodia				482	778	880	1,268
Laos				613	770	929	1,322
Mongolia				435	860	1,333	1,040
North Korea	600	604	869	854	2,824	2,841	1,127
Vietnam	527	505	727	658	836	1,025	2,147
23 Small Asian Countries				1,151	2,080	2,254	2,966
<b>average 29 East Asia</b>	<b>556</b>	<b>535</b>	<b>752</b>	<b>702</b>	<b>1,213</b>	<b>1,339</b>	<b>1,704</b>
<b>average 45 East Asia</b>	<b>580</b>	<b>549</b>	<b>682</b>	<b>669</b>	<b>1,553</b>	<b>2,647</b>	<b>4,329</b>
Bahrain				2,104	4,376	4,104	5,589
Iran	588	719	1,000	1,720	5,445	3,503	5,539
Iraq	588	719	1,000	1,364	3,753	2,458	1,023
Israel				2,817	9,645	12,968	16,360
Jordan	590	718	1,000	1,663	2,388	3,792	4,220
Kuwait				28,878	26,689	6,121	10,145
Lebanon	657	845	1,350	2,429	3,155	1,938	3,507
Oman				623	3,279	6,479	6,896
Qatar				30,387	43,806	6,804	8,915
Arabia/S. Arabia*	550	575	600	2,231	11,040	8,993	7,555
Syria	658	844	1,350	2,409	4,017	5,701	7,698
Turkey	643	825	1,213	1,623	3,477	5,445	6,731
United Arab Emirates				15,798	24,887	13,070	17,818
Yemen				911	1,640	2,272	2,619
Palestine	614	751	1,250	949	2,184	3,806	2,563
<b>average 15 West Asia</b>	<b>607</b>	<b>742</b>	<b>1,042</b>	<b>1,776</b>	<b>4,854</b>	<b>4,863</b>	<b>5,899</b>
<b>average Asia</b>	<b>581</b>	<b>556</b>	<b>696</b>	<b>717</b>	<b>1,719</b>	<b>2,784</b>	<b>4,434</b>

- Figures from 1820 to 1913 include Bahrain, Kuwait, Oman, Qatar, UAE, Yemen and Saudi Arabia.

Source: Maddison (2007a)

