Background Note on "Historical Statistics" in www.ggdc.net/Maddison (March 2010)

Standardized estimates of ***GDP growth*** provide a coherent macroeconomic framework covering the whole economy, which can be crosschecked in three ways. GDP is by definition equal in each of the three approaches. From the production side, it is the sum of value added in different sectors (agriculture, industry and services) net of duplication. On the demand side, it is the sum of final expenditures by consumers, investors and government. From the income side, it is the total of wages, rents and profits. In all three dimensions these measures need to be adjusted to eliminate changes in the price level in the period they cover, so that they show changes in volume. The volume movement is easiest to measure for production and expenditure.

The first SNA manual for standardizing the coverage and modes of estimation of GDP was prepared by Richard Stone and published by OEEC in 1952. Soon after, he produced a similar manual for the United Nations Statistical Office. The latest version is a joint product of EU, IMF, OECD, UN and the World Bank (1993), *System of National Accounts* , Brussels, New York, Paris and Washington DC.

Most official accounts back to 1950 have been standardized according to these guidelines; this is also true for most estimates for earlier years by quantitative economic historians. Until the 1990s, official statistics in communist countries used the Soviet material product system which took a narrower view of the scope of economic activity than the SNA, because it excluded many service activities regarded as 'non-productive'. It also involved double counting (measuring gross output without deducting inter-sector transfers of inputs), which exaggerated economic growth. Since then all ex-communist countries and China have switched to the SNA system in principle, but implementation was complicated by massive changes in ownership, in the level and structure of prices, allocation of resources between consumption and investment, and statistical reporting procedures. It will take some years before these problems can be fully resolved.

Intercountry comparison of economic performance relies on purchasing power parity converters (PPPs) to measure ***GDP levels***, rather than exchange rates. Measures of economic growth over time must be corrected to exclude the impact of inter-temporal price change. The purpose of PPP conversion is precisely analogous: the elimination of inter-country differences in price level, so that differences in the volume of economic activity can be compared across countries. By merging time series for economic growth with the cross-country estimates of GDP levels now available we can make a coherent set of space-time comparisons.

There are several alternative measures of PPPs. For our purpose, the method developed by Kravis, Heston and Summers in their International Comparisons Program (ICP) is by far the best for multilateral comparisons. They adopted the Geary–Khamis (GK) method invented by Roy Geary (1896-1983) and Salem Khamis (1919-2005), which provides transitivity and other desirable properties (see their 1982 volume, *World Product and Income*). In this study, I have taken 1990 as the benchmark year, so my estimates are in 1990 GK $.

Table 1 shows the sources of the PPPs for the benchmark year 1990. There were ICP indicators for 69 countries and an ICP type estimate for China made by myself; these estimates covered 93.7 per cent of world GDP; for 84 countries, representing 5.6 per cent of world GDP, I used the Penn World Tables (PWT), which is a short-cut measure of Alan Heston and Robert Summers. For the other 48 countries, representing 0.6 per cent of world GDP, I made proxy estimates (see Table 1).

Table 1 Nature of PPP Converters Used to Estimate GDP Levels in 1990

(billion 1990 Geary-Khamis dollars and number of countries)

	Europe & W. Offshoots		Latin America		Asia		Africa		World	
ICP	15,273	(28)	2,131	(18)	8,017	(24)	0	(0)	25,421	(70)
PWT	59	(3)	71	(14)	524	(16)	891	(51)	1,516	(84)
Proxies	16	(10)	38	(15)	87	(17)	14	(6)	155	(48)
Total	15,349	(41)	2,240	(47)	8,628	(57)	905	(57)	27,122	(202)

Source: Maddison, *The World Economy: Historical Statistics*, 2003, p. 230

The World Bank (2008) presented new PPP estimates for 2005 for 146 countries. The estimates were made in five regional groups, and then aggregated. There are several good reasons for being sceptical about the new World Bank results. 1) They use the EKS rather than the Geary-Khamis procedure. EKS is appealing to bureaucrats because the ranking of countries within each region cannot be modified in the linking process, because the regions insist on "fixity". It gives all countries the same weight, whatever their size, putting Luxemburg on a par with the USA. 2) EKS produces a lower relative standing of low-income countries than the Geary-Khamis measure I used. In the 1982 study of Kravis, Heston and Summers, p. 96, the average Geary-Khamis GDP result for the lowest income group was 16 per cent higher than the EKS measure. However, the discrepancy between the WB and my results is bigger than can be explained by the bias of the EKS procedure. 3) The World Bank estimate for Chinese GDP is only 43 per cent of the USA, whereas my estimate is 80 per cent; their per capita estimate is only 9.8 per cent for China whereas mine is 18.3 per cent. There is also a strong downward bias (see Table 2) in the WB estimates for India, Indonesia, Korea, Thailand and Vietnam. 4) The Bank does not test the plausibility of its new results. For several years its own *Development Indicators* contained estimates for China similar to mine. There were five previous ICP global studies. These are all dismissed (p. 13) as being "based on very old and very limited data", implying that any discrepancy with earlier findings cannot cast doubt on its weird results for China, India and some other Asian countries. 5) Kravis, Heston and Summers (1982) contained a detailed sophisticated analysis explaining the sensitivity of PPP results to different measurement techniqes which is completely lacking in the recent World Bank study; 6) World Bank results for China are highly implausible when one considers their intertemporal implications. My growth estimate shows Chinese per capita income increasing 12.5-fold between 1950 and 2005. If we merge the WB level estimate for 2005 with my growth estimate, one gets a per capita GDP $4,091 in 2005, and $326 (well below subsistence) in 1950. If one believes the official estimate of per capita GDP growth (21-fold over 55 years), the 1950 level would be $196.

Table 2 compares my estimates of per capita GDP levels for 2005, in 1990 Geary-Ghamis dollars, with the new World Bank estimates in 2005 EKS dollars from World Bank (2008), *Global Purchasing Power Parities and Real Expenditure, 2005;* International Comparison Program, Washington DC. The 130 countries covered in the table represent about 95 percent of world GDP.

Table 2 Maddison & World Bank per Capita GDP Relatives in 2005

	Maddison 1990 GK	% of USA	W. B. ICP, 2005 EKS $	% of USA
USA	30,474	100.0	41,674	100.0
Canada	24,485	80.3	35,078	84.2
Australia	24,064	79.0	32,798	78.7
New Zealand	18,078	59.3	24,554	58.9
4 W. Offshoots	*29,413*	*96.5*	*40,360*	*96.8*
Austria	22,049	72.4	34,108	81.8
Belgium	22,131	72.6	32,077	77.0
Denmark	24,130	79.2	33,626	80.7
Finland	22,169	72.7	30,469	73.1
France	21,513	70.6	29,644	71.1
Germany	19,434	63.8	30,496	73.2
Greece	14,841	48.7	25,520	61.2
Ireland	26,606	87.3	38,058	91.3
Italy	19,303	63.3	27,750	66.6
Luxembourg	37,177	122.0	70,014	168.0
Netherlands	22,819	74.9	34,724	83.3
Norway	27,384	89.9	47,551	114.1
Portugal	14,093	46.2	20,006	48.0
Spain	18,197	59.7	27,270	65.4
Sweden	23,292	76.4	31,995	76.8
Switzerland	23,215	76.2	35,520	85.3
UK	22,438	73.6	31,580	75.8
30 W. Europe	*20,497*	*67.3*	*30,137*	*72.3*
12 E. Europe	*7,255*	*23.6*	*12,260*	*29.4*
15 Former	*6,311*	*20.7*	*9,646*	*22.4*
Argentina	9,019	29.6	11,063	26.5
Brazil	5,750	18.9	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	*6,123*	*20.1*	*9,738*	*23.4*
Japan	21,978	72.1	30,290	72.7
Hong Kong	27,771	91.1	35,680	85.6
Taiwan	19,018	62.4	26,069	62.6
Singapore	24,610	80.8	41,479	99.5
S. Korea	17,526	57.5	21,342	51.2
China	5,575	18.3	4,091	9.8
India	2,419	7.9	2,126	5.1
Pakistan	2,084	6.8	2,396	5.7
Indonesia	3,868	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	*1,604*	*5.3*	*2,223*	*5.3*

Detailed Source Notes by Country for updates to 2008

There are detailed source notes by country in three earlier OECD publications by Maddison: *Monitoring the World Economy,* 1995, *The World Economy: A Millennial Perspective*, 2001, and *The World Economy: Historical Statistics*, 2003. Estimates are shown for the years 1, 1000, 1500, 1700, and annually from 1820 onwards when available. They were updated to 2003 in Maddison, Contours of the World Economy, 1-2030 AD: *Essays in Macroeconomic History*, Oxford University Press, 2007. For updates and revisions of GDP volume movement for earlier years, the sources are shown below.

GDP volume movement for 29 OECD countries updated from *National Accounts of OECD Countries, Volume 1, Main Aggregates, 1995-2006*, pp. 344-5. Updates up to 2008 stem from the IMF, *World Economic Outlook,* October 2009. They cover the USA, Canada, Australia, New Zealand. Japan, the Czech and Slovak republics, Hungary, Korea, Mexico, Poland, Turkey and 17 West European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece (where statistics for 1914-20 were derived from S. Kostelenos, 2003, *Historical Estimates of National Accounts magnitudes in Greece, 1830-1939* and Kostelenos, 1995, *Money and Output in Modern Greece*, Centre of Planning and Economic Research, Athens), Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Switzerland and the UK). These 29 countries accounted for 52 per cent of world GDP in 2006 (24.6 trillion Geary Khamis 1990 dollars). Figures for Cyprus and Malta are available from the Conference Board estimates on the Groningen website. GDP movement in 9 small countries (Andorra, Channel Islands, Faeroe Islands, Gibraltar, Greenland, Isle of Man, Liechtenstein, Monaco and San Marino), 0.015 percent of west Europe's population, was assumed to move parallel to the average for the 12 west European countries shown on my website. Estimates of Norwegian GDP for 1820-1990 are from Ola Grytten, *"The Gross Domestic Product of Norway 1830-2003"* in Etreheim, Klovland and Qvigsted (eds.) *Historical Monetary Statistics for Norway,* 1819-2003, Norges Bank.

New Estimates for Sweden

There have been 6 major studies of the growth and level of Swedish GDP, by Lindahl, Dahlgren and Kock in 1937; Lindahl in 1956, Johansson in 1967, Krantz and Nilsson in 1975. The two latest are by Rodney Edvinsson, *"Growth, Accumulation and Crisis"* in 2005, and Krantz and Schön, *"Swedish Historical National Accounts"* in 2007. Both are published by Almquist and Wicksell These latest studies show faster growth than the earlier estimates I made (based on background material to a 1988 article in the Review of Income and Wealth by Olle Krantz). In my earlier estimate GDP growth was 2.17 per cent a year for 1900-1990, and 1.09 per cent in 1820-1900. This compares with 2.35% and 1.25% for Edvinsson and 2.53% and 1.67% in Krantz and Schön. I have opted for the Edvinnson estimate, as the downward momentum of the Krantz and Schön estimate seemed excessive. It showed a 34 fold drop in per capita income from 2000 to 1800, compared to 26 fold for Edvinsson.

Estimates of Swedish growth before 1800 are not well documented. I had assumed that growth was 0.17 a year between 1500 and 1820, but this becomes excessive once one accepts the Edvinsson estimate of the GDP level in 1820. I have now assumed an annual GDP growth rate in 1500-1820 of 0.07 percent.

Edvinsson made an estimate of GDP growth of 0.18 per cent a year for 1720-1820, but was chary of estimating earlier performance (see his memo *"Annual Estimates of Swedish GDP in 1720-1800"*.Krantz speculated on early Swedish performance in his 2004 article *"An Estimate of Swedish GDP in 1571"* in Heikkinen and van Zanden, eds. *"Exploratons in Economic Growth"*. He concluded that GDP was about the same in the sixteenth century as in 1800. It seems likely that he exaggerates the degree of stagnation in these centuries. Lennart

Schön also speculated on this early period in his paper *"Swedish Historical National Accounts"* for the 2009 History Congress in Utrecht. His is a subtle analysis of Swedish history. It stresses the rapid growth of urbanization in the 17th century, and a later slowdown due to warfare.

Estimates of the 1999-2008 volume movement in East European countries not listed above, were taken from IMF, *World Economic Outlook,* October 2009, for Albania, Bulgaria, Romania and the component republics of the former Yugoslavia. This source was also used for 14 of the component countries of the former USSR.

Estimates for 2002-2008 year-to-year GDP volume movement in 22 Latin American and Caribbean countries were taken from ECLAC, *Anuario Estadistico de America y el Caribe 2009*. GDP movement, 2003-2008 in 24 small Caribbean countries which represented less than 1 per cent of the GDP of the region was assumed to be parallel to that in the 23 bigger countries, GDP for Chile 1820-90 from Rolf Luders (1998), *"The Comparative Economic Performance of Chile 1910-1995"*, Estudios de Economia, 25, no. 2, with revised population estimates 1810-1949 from J. Diaz, R Luders, and G Wagner (2005), *"Chili, 1810-2000, La Republica en Cifras"*, mimeo, Instituto de Economia, Universidad Catolica de Chile. Peruvian GDP 1896-1949 from Bruno seminario and Arlette Beltran (1998) *Crecimiento Economico en el Peru, 1896-1995,* Universidad del Pacifico. Estimates for east and south Asian countries, 2003-2006, were generally derived from year-to-year volume movements in Asian Development Bank, *Key Indicators of Developing Asian Pacicific Countries*, Table 13. For Japan, Korea and Turkey they are from the above OECD source. For Indonesia, annual GDP volume movements, 1990-2008 are from the official national accounts. For India year-to-year volume movements in fiscal years 2002-3 to 2006-7 are from the Reserve Bank of India, *Macroeconomic and Monetary Developments in 2003-4 to 2006-7,* Table 1**.** For China, 1952-2003, they are from A. Maddison and H. Wu, *"Measuring China's Economic Performance"*, *World Economics*, vol 12, no 2. April –June 2008, pp. 13-44. A rough estimate of Chinese 2004-2008 movement was derived by adjusting downwards the official year-to-year volume movement in GDP for these years in the *China Statistical Yearbook 2009*, using the ratio (81 percent) of the Maddison-Wu ratio to convert the official estimate for 1978-2003.

GDP of the Philippines, 1902-40 from R. Hooley "American Economic Policy in the Philippines, 1902-40: Exploring a Dark age in Colonial Statistics" Journal of Asian Economics, April 2005, pp.464-488. The GDP estimates for North and South Korea, 1911-74 were amended to correct an error in Maddison 2003. New estimates for Taiwan 1901-89, were derived from *Historical Statistics: Taiwan***,** Institute of Economic Research, (Hitotsubashi University, Toyo Keizai, 2008, pp. 231-232, column 6. The movement in their GDP volume series in 1960 prices was linked to my estimates for 1990 onward in million 1990 Geary-Khamis dollars. (See Maddison , *The World Economy: A Millennial Perspective*, OECD, 2001, p.298. Midyear population estimates were supplied by Osamu Saito.

For 12 west Asian countries, the estimates are from the IMF, *World Economic Outlook*, October 2009. Turkey 1998-2008 from OECD as above. West Bank and Gaza GDP 2004-8 assumed stagnant at 2003 level. Estimates of the year-to year volume movement for 50 African countries, 1999-2008, were derived from IMF, *World Economic Outlook,* October 2009. The IMF includes Egypt and Libya in the "Middle East' on p. 221. Here they are included in the African total. The IMF does not provide estimates for Mayotte, Reunion, St. Helena, and Western Sahara. Here I have assumed that their GDP movement was the same as the total for the other 52 African countries.