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INTERNATIONAL COMPARISONS OF AUSTRALIAN GDP IN THE 19TH CENTURY

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This paper summarises the results of a new comparison of the level of Australian and U.K. real product in the 1890s, obtained by the direct deflation of money values of GDP by relative prices. The object of the study was to provide a check on the existing comparisons, obtained by extrapolation of time series of real GDP, as shown, for example, in Maddison (1982). Existing estimates imply that in the 1890s Australian GDP per capita was about 50 percent higher in the U.K. and U.S.A. and more than twice that for the average of 12 other western countries. The present study suggests these results probably overstate Australia's real GDP, and that Australian real GDP per capita was 36 percent higher than the U.K.'s in 1891 and 3 percent higher in 1900. Personal consumption per capita was 15 percent higher in Australia than in the U.K. in 1891, but about the same level in 1900.

Although this study compares prices and GDP in the colony of New South Wales with those in the U.K., the colony may be taken as representative of Australia as a whole.[1]

INTRODUCTION

In recent years there has been considerable interest in the slower rate of growth of Australian GDP since the 19th century compared to that of other western countries. Australia appears to have regressed from a level of GDP per capita which was well above that of other countries in the 19th century to a position in the middle rank of OECD countries by the 1980s. Comparative figures, based on Maddison, are given in Table 1 (columns 1 to 4). They have led to much debate. It has been argued that Australia's relative decline is due to inappropriate industry policies which have resulted in an inefficient manufacturing sector sheltered behind a high tariff wall. In any event, current discussion of industry policy in Australia frequently takes as its starting point the apparent long-term deterioration in Australia's economic performance, as measured by the existing estimates of real GDP.[2]

Maddison's estimates for the 1890s are derived by extrapolating time series of GDP backwards from 1970 for a number of countries. The starting estimates are based on Kravis, Heston and Summers (1978). The Australian series used in

Note: This is a revised version of a paper presented to the 20th General Conference, IARIW, Rome, August, 1987. This version incorporates comments and suggestions from referees and the participants at the IARIW Conference, in particular from Angus Maddison. The paper has also benefited from comments from Alan Hall, and Neville Cain and Bob Allen of the Economic History Department, ANU.

[1] "According to Coghlan, for example, "The conditions of life and style of living are much the same (in N.S.W.) as in the other colonies... and expenditure and the cost of living in N.S.W. may be taken as fairly indicative of the state of things obtaining in Australia generally." (*The Seven Colonies of Australasia*, 1891, page 179. Also the 1899-01 edition, page 419.)

[2] For example, Vines (1987).

TABLE 1

SOME INTERNATIONAL COMPARISONS

	Maddison productivity[a]		Maddison per capita[b]		Mulhall per capita	Days earnings equal to annual cost of food[d]
	1891	1979	1891	1979	1891	
	U.S.A. = 100		U.S.A. = 100		£	
N.S.W.						98
Victoria					44.3	
Australia	153	78	154	74	40.2	
U.K.	100	66	98	66	33.7	127
U.S.A.	100	100	100	100	39.0	76
Canada	81	85	77	89	26.0	98
Average of Western Countries	68[e]	75[e]				139[f]

[a]Maddison (1982, p. 98). U.S.A. = 100.
[b]Calculated from Maddison (1982). U.S.A. = 100.
[c]Victorian Census (1891, p. 221). Victoria is an estimate by Hayter (see text).
[d]The Wealth and Progress of N.S.W. (1893, p. 182).
[e]12 countries, excluding U.S.A.
[f]15 countries, excluding U.S.A.

the comparison were compiled by the historian Butlin (1962), and covered the period 1861 to 1939. These estimates have been widely criticized by economists and economic historians. It has been argued, in particular, that they contain an usually large number of mistakes and that the results do not conform to historical experience.[3]

For purposes of long-term comparison, two major limitations are (1) that for rural and manufacturing industries Butlin relied on recorded values of production and indicators of factor output without correcting for changes in coverage in the recorded statistics[4] and, (2) that the price data used for deflation are inadequate before the 1920s. Reviewing his results Butlin noted that the deflated series "have some plausibility for the period 1861-1920. After 1920 the deflated estimates have little meaning in relation to those before 1920." However, in their reviews of Butlin, both Colin Clark (1963) and Lydall (1963) were critical of Butlin's deflated series over the whole period.[5]

[3]Boehm (1965), for example, lists a number of "methodological and statistical errors" in Butlin's estimates, while both Buxton (1967) and Bailey (1957) comment on the lack of historical relevance of Butlin's figures for investment in the 19th century. Other writers who have criticised Butlin include Beever (1964), Clark (1963), Lydall (1963), Hall (1965), and Thompson (1970).

[4]This mainly relates to the estimates before 1900. Butlin made little use of the population census as bench-marks for either production or other data. By contrast, in the early official estimates of GDP in the 19th century based on the incomes method, the colonial statisticians, Coghlan and Hayter, fully exploited the census data and from 1897 official and unofficial estimates of G.D.P. used available tax data of incomes (e.g. Coghlan, 1900; Sutcliffe, 1926; Clark and Crawford, 1938). Comparison with these estimates suggests errors in Butlin's figures of 30 percent or more.

[5]Lydall (1963) argues that Butlin's price indexes "cannot stand up to much criticism. They use various combinations of available wholesale prices, retail prices, wage rates, etc.; but the weightings are often quite arbitrary and bear no clear relation to the purpose of the indexes, namely to deflate value added." He considered the estimates of real product in manufacturing as being "hardly credible." He added that "Perhaps it would have been wiser if he (Butlin) had refrained from publishing his deflated series at all" (p. 210). Colin Clark (1963) noted that Butlin's price series used to deflate

Another source of error is in the bench-mark estimates for 1970. The Australian figures are based on private research (Haig, 1968), comparing real GDP in Australia and the U.K. and later results are now available for 1985 from the PPP project. Thus errors in the 19th century estimates of real GDP may arise from—(i) the estimates of GDP for the period at current prices, (ii) the indexes of price changes from the late 19th century to 1970 and, (iii) the bench-mark estimates of real GDP in 1970.[6]

These recent estimaters of late nineeenth century GDP may be contrasted with some by contemporaries. Mulhall's[3] estimates (column 5 in Table 1) were derived by applying his formula to values of recorded production and converted to equivalent prices by the exchange rate. Hayter's estimate for Victoria is an average of the results of applying Mulhall's formula and an independent calculation based on data of incomes and production, also revalued by current exchange rates. The comparison using the cost of food (based on Mulhall's figures) may be justified by the apparent low income elasticity of expenditure and high price elasticity. This comparison relates more to real income than GDP, but both these results show a lower figure for Australia in the 1890s than those given in Maddison.

The main object of this paper is to provide a more accurate measure of relative prices (Purchasing Power Parities) in N.S.W. and the U.K. and to use the results to deflate money values of GDP in 1900 to equivalent prices. Comparative figures of GDP are also derived for 1891, by varying the results for 1900 by indexes of real product and prices in the two countries. New estimates of GDP for N.S.W. in the 1890s were compiled based on expenditure data, while the results are contrasted with new time series estimates which incorporate revisions to Butlin, made by Pincus and McLean (1982).

The next two sections outline the main sources and methods used. Summary results are given in the last two sections.

The results show that in 1891 Australian real GDP per capita was probably about 30 percent higher in 1900, or much lower relatively than shown by the time-series data. A large part of the difference is due to the new bench-mark estimates available from the PPP study for 1985. Butlin's estimates, used for the Australian data, also overstate the money values of Australian GDP.

A higher proportion of GDP was used for investment in N.S.W. than in the U.K. and the real consumption per head was about 15 percent higher in Australia in 1891, but was about the same in the two countries in 1900.

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value added in manufacturing, was "obtained from a few final products, with a high raw material content, and from wages of industrial workers. The price index for the distributive trades is still harder to understand ... The consequences of this choice of index, as could have been foreseen, are calamitous ... the combined effect of (the) assumptions being tantamount to assuming that productivity never increases" (p. 199). Comparison with the more reliable estimates compiled by Clark and Crawford for the years 1928-29 to 1937-38 suggest that in this period Butlin's series understate the growth of GDP by 40 percent.

Despite the criticisms, and Butlin's reservations, no serious attempt, however, has been made by historians (including Butlin) or economic historians to extend or improve the deflators.

[6]However, the 1970 estimates may be more reliable. The methods (including the price weights used) are consistent with those used in the present study and there is evidence that the estimate for the U.K. in 1985 in the PPP project may be too high and the Australian estimates accordingly understated relative to those for the U.K. (See Haig and Wood, 1988.)

The Comparison of Money Values of GDP

One of the main problems in international comparisons of historical data is the absence of detailed figures of expenditure or output of countries. There is generally no shortage of data of prices, and international comparisons of the cost of living and relative prices of household consumption appear to have been a major preoccupation of statisticians in the late 19th and early 20th centuries,[7] In Australia, data about relative prices and wages were also collected for the information of intending migrants. However, there are comparatively few estimates of aggregate expenditure by country for the late 19th century.

For the U.K. and N.S.W., however, estimates are available of expenditure on personal consumption for the year 1900, covering most of the expenditure data needed to revalue GDP. The U.K. estimates were compiled by Prest (1954), for the Cambridge National Income Study; those for N.S.W. by Coghlan for some years from 1888 to 1900.[8] Coghlan only published summary results. He did not set out the sources and methods used and for this reason his estimates have been neglected by Australian historians. However, his working sheets and manuscript data are now available, making it possible to compare his methods and results with those of Prest, and to reconcile the definitions used in the two studies.[9]

The figures for consumption covering about 80 per cent of total domestic output, provide much of the expenditure data in the two countries. Estimates for the remaining items of expenditure on GDP are given for the U.K. in Feinstein (1972) and can be derived for N.S.W. from official publications. Independent estimates of GDP based on data of production and incomes are also available for the two countries, which provide a check on the expenditure estimates. For the U.K. the figures are given in Feinstein (at factor cost) and for Australia they were made by Coghlan and published in issues of *The Wealth and Progress of N.S.W.* The main components of the estimates are given in Table 4.

As noted earlier, Coghlan did not publicly describe his sources and methods. In general, however, his approach was very similar to that adopted in the current official estimates for Australia and is also generally comparable with that used by Prest. Broadly speaking, he adopted three different procedures, depending on the type of data available—

1. For some items of food, for tea and coffee and for some other items, expenditure was estimated by multiplying quantities of apparent consumption by retail prices; apparent consumption being derived from data of production, imports or exports or quantities cleared through customs. Retail prices were from official publications or special collections. (In the present study a minor change was made to Coghlan's estimate to revalue food produced and consumed on

[7]Major sources of data of prices are reports of the tariff enquiries in the U.S.A. in the 1890s; enquiries by the British Consular Service in the 1880s, and reproduced in the Parliamentary Papers; comparisons made by the U.K. Board of Trade in 1907 and the Aldridge Report of the U.S. Senate in 1892. Other results are described in, for example, Burnett (1969), Colin Clark (1951), and Mulhall (1883).

[8]Published in issues of *The Wealth and Progress of N.S.W.*

[9]Arndt and Butlin (1952) also produced estimates of GDP in N.S.W. for 1891, based on Coghlan's working sheets, but it not clear to what extent or why their estimates differ from those of Coghlan's.

farms at farm prices.) Quantities of output of taxi cabs were also estimated from numbers of cabs, drivers and average cost.

2. Expenditure on many service items was based on statistics of output or sales, adjusted for business expenses. Thus expenditure on trains, tram and postal services was derived from the revenue of public authorities.

3. For most other goods, expenditure was estimated by adding a mark-up to values of imports less exports plus production of local goods. Since local output was not collected, its value was estimated generally from data of employment to which was applied an average wage and profit mark-up. There was very little output competing with imports, which accounted for the bulk of other estimated expenditure on goods (other than drink and tobacco). For some miscellaneous household expenses, an estimate of per capita consumption was multiplied by population.

For this study in general I have adopted Coghlan's methods of estimation, and where possible his figures.[10] There is no reason at this stage to query the methods used in his estimates or assumptions about mark-ups, the proportion of business expenditure, etc. and it would, in fact, be difficult to improve on the methods in these estimates.

Estimates of outlay on building and construction are based on expenditure on public works and numbers employed in other buildings (from the censuses of population) and average wages, and investment in fixed equipment is derived from data of production and imports of plant and equipment. It is estimated that 90 percent of fixed investment was imported and the trade statistics provide comprehensive data of these imports. The imports are valued at cif and are probably slightly overstated. (Wilson, 1931.)

Public authority current expenditure is estimated at 150 percent of wages of government employees shown as professionals in the 1891 and 1901 censuses, and the results checked against public accounts. Imports and exports are trade figures. No adjustment is made for gold produced (as in the later official estimates) or for freight (which is assumed to be included in the value of imports). No data are available for imports or exports of services (including insurance, travel abroad, etc.). These amounts are relatively small.

Relative Prices

A good deal of information about prices needed for the comparison is available from the expenditure studies. Where information is estimated by multiplying assumed quantities consumed by retail prices, the calculations automatically give the data of retail price. The expenditure data yield prices for most items of food, drink and tobacco. Prices for most other items were obtained from official publications and reports, and various surveys, including household budget enquiries. The main problem was to assess the relative price of local production and imports. Local costs were high due to high money wages and production was confined mainly to products where transport costs were high (such as bricks) or where Australia had a natural advantage (tallow). There was, however, some

[10]In addition to a separate valuation for food produced and consumed on farms, an estimate of rates and water charges are added to rent, since they are included in Prest's estimates.

production which competed with imported goods including, for example items of furniture, clothing and footwear, and some metal products. Prices of local production were based on assessments made for government enquiries of the relative costs of local and imported goods.[11] The resulting estimates were then brought up to 1900 using movements in internal costs derived from data of employment and output given in the results of censuses of production.

For goods which were entirely or almost entirely imported, prices in 1900 were assumed to be higher in Australia by the average rate on freight on imports, as given in Wilson (1931). Prices in 1891 were then estimated by varying the 1900 figure by Wilson's price index of imports.

There remained some items (including "other goods and services," amounting to 10 percent of all consumption expenditure) where relative prices could not be estimated. They were imputed from prices of other items.

There is little information available about the quality of items of consumption in the two countries. The only adjustment made for quality difference is for meat, where it was assumed that the quality of beef and mutton consumed in N.S.W. was 20 percent below that consumed in the U.K.[12] There may have been large differences in the quality of other items (such as, for example, butter and rent).[13] Overall the quality of consumers goods may have been lower in N.S.W.

The comparison of rent also raises particular problems. In the 19th century rents of different types of dwellings were collected in the censuses in N.S.W., but not in the U.K. (where aggregate rent is estimated from tax data). Comparison of census results for N.S.W. with family budget data for the U.K. suggest that rents may have been about 10 percent higher in N.S.W.[14] Rent also accounted for about 10 percent more of consumption expenditure in Australia than in the U.K.

Expenditure on buildings and current government expenditure is deflated by relative wages.

Real expenditure in N.S.W. in 1891 (at 1900 prices) was estimated partly by deflating expenditure at current prices and partly from direct estimates of the quantity of consumption. For most food, drink and a large part of expenditure on goods, reasonably reliable estimates were possible by deflation or from

[11]Relative prices are discussed, for example, for furniture and clothing in the Report on the Census and Industrial Returns Act (1891-2), for footwear in the Report of the Commission on Strikes (1891) and for railway equipment in the Report of the Royal Commission appointed to inquire into charges against Mr E. M. Eddy (1892).

[12]Mutton in Australia was a by-product of wool, and the breeds of sheep were less well adapted for meat production than in the U.K. As noted by Jeans (1972) "The merino was the chief drawback to the development of the meat export industry. Its meat was tough and unattractive in colour and taste" (p. 289). The 1890s were years of drought in N.S.W. and this may also have affected the quality of meat. The 20 percent allowance for lower quality of meat consumed in Australia is arbitrary and is based largely on the difference in the relative prices of frozen meat imported from New Zealand and Australia in 1903, as given in Agriculture (1904, p. 28).

[13]See, for example, Department of Agriculture, (1904, p. 29) where reference is made to the "fishy" taste of N.S.W. butter. See also comments on the quality of food in N.S.W. in issues of *The Wealth and Progress of N.S.W.*, for example, 1892, p. 851. The quality of houses may also have been lower in N.S.W. For example, Pincus and McLean (1982, p. 1) assert that in 1890, one in every 12 dwellings in Australia was constructed of "extremely flimsy, temporary or inferior materials (for example tents)."

[14]As given, for example, in Burnett (1969).

estimates of the apparent quantities. However, for much of services and some goods, per capita consumption was assumed to be the same in 1891 as in 1900.

The details of expenditure on consumption goods at current and constant prices are given in Tables 2 and 3.

As would be expected, prices are relatively lower when they are weighted by the local consumption. In 1900, food was 29 percent more expensive in the U.K. when the items are weighted by Australian quantities, and 16 percent more expensive when weighted by U.K. expenditure. The much lower prices for beef and mutton in Australia, however, accounts for most of the difference in prices. This is even after the small adjustment, noted above, for the apparent lower quality of Australian meat. Prices of all consumption goods are 4 percent higher

TABLE 2

PERSONAL CONSUMPTION AND INVESTMENT EXPENDITURE N.S.W. 1891 AND 1900 (£000)

	1891		1900		
	Current prices	1900 prices	Current prices	U.K. prices	U.K. relative to N.S.W. = 1.0
Personal consumption					
Bread	2,968	2,275	2,430	2,487	
Meats, etc.	5,194	4,885	5,932	10,897	
Dairying products	2,813	3,018	3,342	3,711	
Vegetables	902	1,279	1,172	1,149	
Sugar, etc.	1,699	1,157	1,638	1,324	
Tea, etc.	1,027	1,109	892	991	
Other food	2,433	(2,285)[b]	2,712	(2,766)[b]	
All food	17,036	16,008	18,118	23,325	1.29
Alcoholic drinks	4,421	4,180	4,257	3,833	
Tobacco	1,093	1,248	1,329	993	
Rents	6,181	5,473	6,366	5,810	
Fuel	1,696	1,331	1,713	1,328	
Other household goods	2,484[a]	2,393	2,752	2,799	
Clothing	7,960	7,519	8,506	7,818	
Reading	611[a]	605	743	591	
Travel	2,038	1,817	2,108	1,674	
Communication	358	397	399	374	
Medical, etc.	1,673[a]	1,665	2,208	2,401	
Other goods and services	4,661[a]	(4,661)	5,531	5,098[c]	
Other consumption	33,176	31,289	35,912	32,719	0.91
All consumption	50,122	47,297	54,030	56,044	1.04
Investment					
Building and construction	9.03	8.58	6.45	4.29	
Plant and equipment	3.91	3.84	3.83	3.33	
All investment	12.94	12.42	10.28	7.62	0.74

[a]Prices for some items assumed to be same as in 1900.

[b]Relative prices assumed to be the same as for other food (excluding meat).

[c]Relative prices assumed to be the same as for other consumption (excluding drink, tobacco and rent).

TABLE 3

PERSONAL CONSUMPTION EXPENDITURE U.K. 1900 (£m)

		N.S.W. Prices	U.K. relative to N.S.W. = 1.0
Personal consumption			
Bread	67.4	65.7	
Meat, etc.	177.1	105.4	
Dairy products	87.5	79.3	
Vegetables	45.2	45.9	
Sugar, etc.	38.1	49.5	
Tea, etc.	21.0	19.0	
Other food	95.6	95.7[a]	
All food	531.9	460.5	1.16
Alcoholic drinks	194.7	244.2	
Tobacco	27.0	26.5	
Rents	176.7	161.3	
Fuel	78.4	97.9	
Other household goods	140.4	139.1	
Clothing	153.2	166.4	
Reading	14.9	19.0	
Travel	82.0	111.9	
Communication	5.4	5.8	
Medical, etc.	50.9	50.5	
Other goods and services	179.2	201.5[b]	
Other consumption	1,102.8	1,224.1	0.90
All	1,634.7	1,684.6	
All consumption[c]	1,638.7	1,688.7	0.97

[a]Relative prices assumed to be the same as for other food (excluding meat).

[b]Relative prices assumed to be the same as for other consumption (excluding drink, tobacco and rent).

[c]Includes expenditure abroad.

in the U.K. using Australian quantities as weights, and three percent lower using U.K. quantities.

Comparisons of total real expenditure and real expenditure per capita and per person employed are given in Table 4 and the results are summarized in Table 5. In 1891, Australian expenditure on domestic output and GNP was about 33 and 22 percent higher in the U.K. However, personal consumption expenditure was only 15 percent higher in Australia, as a result of the much higher expenditure on investment goods. Similarly, the much higher proportion of GDP paid abroad reduced the relative level of Australia's GNP per capita.

Australian real expenditure, GNP and GDP were all relatively much lower in 1900 (due both to the effects of the depression in Australia in the 1890's and to growth in the 1890's in the U.K.). Real consumption expenditure per head had fallen from 15 percent above the level in the U.K. in 1890 to about the same in 1900, and real GNP per head was lower in Australia than in the U.K.

SOURCES OF DIFFERENCE

The results show much lower relative figures for Australia than the estimates given in Maddison. The main sources of difference are revisions made to Butlin's

TABLE 4

DOMESTIC EXPENDITURE AND GNP, U.K. AND N.S.W. 1891 AND 1900

	U.K.				N.S.W.			
	1891		1900		1891		1900	
	Current prices	1900 prices	Current prices	N.S.W. prices	Current prices[a]	1900 prices	Current prices	U.K. prices
Total (£m)								
Consumption	1,315	1,365	1,637	1,687	50.1	47.3	54.0	56.0
Investment	94	109	199	270	12.9	12.4	10.3	7.6
Current expenditure of public authorities	87	92	182	185	3.7	3.3	3.6	3.7
Domestic expenditure	1,521	1,566	2,018	2,142	66.7	63.0	68.0	67.3
Exports	411	378	467	467	25.9	25.7	28.2	28.2
Less imports	−432	−382	−535	−535	−25.4	−24.8	−27.6	−27.6
GDP	1,500	1,562	1,950	2,074	67.2	63.9	68.6	67.9
Plus net income from abroad	94	83	104	104	−3.0	−3.0	−4.5	−4.5
GNP	1,594	1,645	2,054	2,178	64.2	60.9	64.1	63.4
Coghlan[b]					66.4[c]		63.5[d]	
Per capita (£)								
Consumption	34.8	36.1	39.8	41.0	44.3	41.4	39.9	41.4
Domestic expenditure	40.0	41.4	49.0	50.2	58.6	55.0	50.2	49.7
GDP	39.7	41.3	47.4	50.4	59.0	56.0	50.7	50.1
GNP	42.2	43.5	49.9	53.0	56.4	53.3	47.3	46.8

[a]Some items valued at 1900 prices (see Table 2).
[b]At factor cost.
[c]1892 The Wealth and Progress of N.S.W. (1893, p. 860).
[d]1899, *The Seven Colonies of Australasia* (1899-1900, p. 736).

TABLE 5

EXPENDITURE AND PRODUCT N.S.W. AND U.K.

(N.S.W. relative to U.K. = 1.00)

	1891 (1900 prices)	1900 Current prices	1900 U.K. prices	1900 N.S.W. prices	1900 Average
Per capita					
Personal consumption	1.15	1.00	1.04	0.97	1.00
Domestic expenditure	1.33	1.02	1.01	1.00	1.00
GDP	1.36	1.07	1.06	1.01	1.03
GNP	1.22	0.95	0.94	0.89	0.91

TABLE 6

GDP PER CAPITA AND IMPLIED PRICE DEFLATORS, 1871-1985

	1870	1871	1891	1900	1970	1985
1. Real GDP per capita—1970 bench mark[a]						
Australia	1,393	1,311	1,835	1,566	3,883	
U.K.	936	977	1,161	1,312	3,297	
Ratio	1.49	1.34	1.58	1.19	1.18	
2. Real GDP per capita—1970 benchmark[b]						
Australia	1,181	1,199	1,615	1,475	3,883	
U.K.	936	977	1,161	1,312	3,297	
Ratio	1.27	1.23	1.39	1.12	1.18	
3. Real GDP per capita—1985 benchmark						
Australia[b]	2,816	2,859	3,851	3,517	9,261	11,738
U.K.	2,421	2,527	3,003	3,393	8,529	10,915
Ratio	1.16	1.13	1.28	1.04	1.09	1.07
4. GDP per capita. Current prices						
Australia[c]	50.6	49.5	64.0	54.1	1,254	7,231
U.K.	35.8	38.7	39.7	47.4	928	6,215
5. Implied Price Deflators—1985 bench mark						
Australia	18.0	17.3	16.4	15.2	135	616
U.K.	14.8	15.3	13.2	14.0	108	567
Ratio	1.22	1.13	1.24	1.09	1.25	1.09

[a]From Maddison (1982).
[b]Incorporates estimates by Pincus and McLean (1982).
[c]Feinstein (1972) and Pincus and McLean (1982).

estimates by Pincus and mcLean (largely to exclude the increase in the value of livestock), and the use of the *PPP* results for 1985 as new bench-marks for real GDP, replacing the Kravis, Summers and Heston results for 1970. The effect of these changes is given in Table 6.[15]

The first lines, 1, in Table 6, show the comparative figures derived from Maddison. In 2, the Australian series incorporate recent revisions to Butlin's

[15]However, as noted in [6] the 1970 benchmarks may be more accurate than those for 1985.

estimates by Pincus and McLean (1985). In 3, the new bench-mark series from the 1985 PPP project replace the 1970 bench-marks devised by Kravis, Summers and Heston. After these two adjustments Australian real GDP per capita is about 28 percent higher than for the U.K. in 1891, and 4 percent higher in 1900. The figures are comparable with the results of the present study, which show real GDP higher in N.S.W. by 30 percent and 3 percent in 1891 and 1900. If, on the other hand, the bench-mark estimates for 1970 are adopted, then the comparative figures based on the time series data are considerably above the present estimates.

Conclusions

The main conclusion, then, is that while N.S.W. per capita GDP and real consumption were above the U.K.'s in 1891, it was not as high as usually thought, and the levels were comparable by 1900. Moreover, 1891 appeared to be an exceptionally good year for N.S.W. and per capita GDP was higher than in, for example, the 1870s.

This good 1891 outcome may be partly a consequence of the great strikes of late 1890 in the wool industry and on the docks. Part of 1890 production was probably recorded in 1891. The decline from 1891 to 1900 would mainly reflect the effects of the great turn of the century drought, and rabbits on the output of wool and wheat which together with the 1890s depression induced a shift of production into less productive local manufacturing and related industries.

The present results may not have surprised contemporary writers. In early issues of *The Wealth and Progress of N.S.W.* Coghlan included tables of aggregate incomes of N.S.W. and other countries (based on Mulhall and converted by exchange rates), but in later issues comparisons were confined to the proportion of income spent on food in different countries. This implied that real income in N.S.W. (in the late 1880s) was about 30 percent higher than in the U.K., but below the level in the U.S.A. and about the same as in Canada (column 6, Table 1). In 1900-01 Coghlan considered that "as far as primary food requirements are concerned the purchasing power of money is greater in Australia (than in a number of other countries); house rents, however, are higher, as well as the price of most descriptions of wearing apparel."[16]

The results also suggest that, at least from 1900, the rate of growth of Australian GDP per head has been above that of the U.K. In addition, the overall rate of growth in Australia has also been depressed by changes in the industry composition of production, particularly the decline in agriculture. In 1985 agriculture was more than twice as efficient in Australia as in the U.K. (Haig and Wood, 1988) and was certainly higher in the 1890s, but the share in employment of rural industry over this period fell from 25 percent to about 10 percent. The estimates suggest, therefore that the productivity of Australian manufacturing and service industries has probably increased, at least relatively to the U.K., since the late 19th century, and possibly by as much as 20 percent.[17]

[16]The Seven Colonies of Australasia, 1901-02, p. 368.

[17]Assuming a fall from 25 to 10 percent in the share of employment in agriculture in Australia and that productivity in agriculture was twice that in Britain in the 1890s and 1980s.

Finally, it was noted by Baumol (1986, Chart 2), that Australia appeared to diverge in the relationship between rates of growth and levels of real GDP per capita, as predicted by the convergence hypothesis. The reduction in Australia real GDP in the late 19th century suggested by this paper brings the relationship more closely into line with that for other countries. Thus, to this extent, at least, Australia's performance over the past 100 years has not been exceptional.

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