

Comparing Australia: international GDP rankings and revealed preference

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Abstract

Data on volumes and prices of consumption and investment are used to compare Australian real GDP for 1990 with the other OECD countries. Australian consumption patterns, including leisure, and price structure are very different from most other countries and especially from Japan's. The Australian bundle of consumption, investment and leisure is revealed preferred to that of Japan and a number of other countries which are conventionally ranked above Australia in comparisons of real GDP *per capita* at international prices.

Introduction and summary

Economic commentators regularly bemoan the decline in Australian productivity and living standards relative to our trading partners, especially Japan and other industrialised nations of the OECD. A recent report by the Industry Commission (1991) is fairly typical in urging further reform in Australia using unfavourable international comparisons as evidence of pressing need. They claim (IC, 1991, p. 6) that "It is perhaps too little appreciated in Australia how fast the standard of living of our neighbours is rising, including in Japan..", citing World Bank figures which purport to show that Japanese living standards were similar to those of Australia in 1980 and had grown to a level 66 percent above Australia by 1989.¹

Criticism of Australian economic performance has typically cited international comparisons of both levels of output and rates of growth of output. Recent studies have, however, suggested that whilst Australia's post-war growth record has certainly not been exemplary, neither has it been as poor as some commentators have claimed.² Our purpose here is to compare the level, rather than rate of growth, of economic performance. Our primary data source is a recent publication by the Australian Bureau of Statistics (1992) which reports on OECD comparisons of real consumption and investment across the twenty four member countries in 1990. These data allow us to compare, for instance, the average amounts of

¹The Industry Commission fail to point out that the World Bank figures on GNP per capita are converted into US dollars using current exchange rates, ignoring deviations from purchasing power parity.

²For instance, Dowrick and Nguyen (1989) find that adjustment for cyclical fluctuations, for technological catch-up and for rates of population growth accounts for most of the gap between Australian and average OECD rates of growth.

meat, medical services or books consumed by Australians, Americans, Europeans and Japanese. We also have information on the relative prices of goods and services and on wages and hours of work, so we can determine whether the "representative" Japanese could have worked Australian hours and afforded the consumption (and investment) bundle of the "representative" Australian, and *vice versa*. We then use the criterion of revealed preference to rank the 24 OECD countries. This procedure and the results are described in Section 3.

First, however, we examine the aggregate measure of Gross Domestic Product which is most often used as an indicator of economic success. In Section 1 we show that there are substantial differences in demographic structure, labour force participation rates and hours of work across the OECD which imply that rankings of GDP are very sensitive to the denominator - population, workforce or hours worked. In particular the Japanese work more and longer than Australians, so whilst Japan is some ten percent ahead of Australia in terms of aggregate output per head of population, the two countries are almost identical in terms of output per person employed and Australia is thirty per cent ahead in output per hour of work.

We go on to argue in Section 2 that such comparisons of constant price GDP are not necessarily indicative of relative welfare levels. Relative prices vary substantially across the OECD, and most especially between Australia and Japan. For example, private medical and health services are very cheap in Japan, relatively expensive in Australia, and the quantities consumed vary inversely

with price. If the price vector which is used to construct "real GDP at constant OECD prices" values medical services highly, then Japan will do relatively well on the comparison whereas a low valuation will favour Australia.

Where rankings are so sensitive to the calibration of the measuring rod, we can have little confidence in using such international constant price comparisons. We suggest that a meaningful welfare comparison can, however, be made using the criteria of revealed preference derived by Samuelson (1947) and Varian (1982). The bundles of goods and services which constitute GDP are evaluated using in turn each country's own price structure.

We report findings in Section 3 that the Australian consumption bundle is revealed preferred to the Japanese bundle. Although the Japanese bundle which comprises GDP (including investment and net exports) is revealed preferred to the Australian bundle, the ranking is reversed when we take account of Australian's considerably greater leisure time by adding non-working hours to the comparison. (Furthermore, the assumption of common tastes, which underlies the revealed preference test, is not violated by the observed patterns of prices and quantities.) Taking account of leisure, Australia is found to be less well off than ten North American and Northern European countries, on a par with Finland and better off than the remaining twelve OECD countries including Japan, Sweden, the UK and the Netherlands.

We suggest that these findings give a much better indication of Australia's economic performance and relative standing than do

the ubiquitous comparisons of constant price GDP per capita, or the still frequent comparisons based on exchange-rate conversions.

1. International comparisons of aggregate output

The measure of economic activity which is most commonly used for the purposes of international comparison is GDP per capita. Columns 4 and 5 of Table 1 shows the OECD rankings for 1990 with Japan in sixth place, three per cent above the OECD average and Australia in fifteenth place, nearly seven percent below the average.

These figures have been derived from detailed comparisons of prices and quantities for hundreds of goods and services in each of the 24 countries. The International Comparison Project (ICP, 1985) acknowledges the tremendous problems in standardising characteristics and quality of goods and services across countries, but their efforts and those of the OECD study which is used here (ABS, 1992) have produced by far the best available estimates by which we can compare output and consumption across countries. Our quarrel is not with the ICP data, indeed we rely heavily upon it, but with the method of aggregation and presentation which lend a spurious authority to the apparently unambiguous rankings of the league table.

Inspection of the index of real GDP per capita in column 5 of Table 1 reveals that there is very close clustering in the middle of the table. Australia is in the middle of a group of ten countries ranging from Denmark down to the Netherlands which lie within a range of only six percentage points. Given annual fluctuations in real output of several percentage points, and even ignoring measurement

error, the rankings within this group would appear to be very dubious as indicators of relativities.

Whilst we acknowledge these deficiencies in the league table approach, our analysis is based on a quite different point. Namely that these rankings ignore variations across countries in working hours and in relative prices of goods and services. The following sections will deal with price variations. In this section we conduct a preliminary investigation of variations in hours of work.

Column 1 of Table 1 gives the percentage of the population recorded as employed in 1990. Australia is one point below the unweighted mean of 47.2 percent. Japan is more than three points above the mean and Sweden more than five points above, whilst the US is close to the mean. We use these four countries to illustrate the factors underlying variations in employment rates.

Column 1 of Table 2 shows that demographic differences are significant. The proportion of the total population which is of regular working age is nearly 3 points higher in Japan than in Australia. Allied with Japan's lower unemployment rate (see column 4), this explains most of the difference in the aggregate employment rate (column 5). High employment rates relative to Australia are also explained in substantial part by the observation that far more US and, especially, Swedish women participate in the labour force (column 2).

Table 2: Demographic and labour force characteristics of four countries

	1	2	3	4	5	6	7
	pop.15-64 / / total pop.	female labour force / pop 15-64	male labour force / pop 15-64	employ / labour force	total employ. / total pop.	hours worked	hours per week per populati on
	%	%	%	%	%		
U.S	65.6	68.2	85.8	94.6	47.8	34.7	16.6
Japan	69.8	60.4	87.8	97.9	50.6	46.9	23.7
Sweden	64.3	81.1	85.3	98.5	52.7	37.5	19.8
Australia	67.0	62.1	85.9	93.1	46.2	34.6	16.0

Sources

National Accounts Vol 2 1978-90, OECD: Paris, 1992

I.L.O. Yearbook of Labour Statistics 1989/90: data for 1989 or latest

Labour Force Statistics 1970-1990, OECD: Paris, 1992

These figures suggest that output per head in Australia may be lower than in some other OECD countries simply because we work less. Indeed, columns 6 and 7 of Table 1 shows that comparing levels of real output *per employee* puts Australia almost on a par with Japan and some six percentage points above Sweden, moving Australia from fifteenth to thirteenth position.

We find further evidence that Australian's work less than most of their OECD counterparts by comparing average hours of work. Column 2 of Table 1 shows that the representative Australian employee worked just under 35 hours per week, whereas the sample average is over 37 hours and the Japanese figure is nearly 47 hours. The employment ratios and hours are combined in column 3 to give a measure of hours of work per week per head of population. The representative Japanese household, compared to the representative Australian household, devotes nearly 50 percent more hours to paid employment. Ranking real output *per hour* in columns 8 and 9 of

Table 1, we see that Australia moves up to tenth position in the rankings, well ahead of Japan.

Our figures on employment ratios comes from the OECD Labour Force Statistics which are a generally reliable and consistent source. The estimates of hours of work per employee are not so consistent. Our source is the International Labour Organisation "Year Book of Labour Statistics" which is unable to compile statistics on a fully comparable basis. The figure we seek is the average hours of all those recorded as working by the OECD source. For some countries, however, the ILO is able only to provide estimates for those working in the manufacturing sector: Denmark, Finland and Ireland. The UK estimate is biased upwards by the exclusion of part-time workers. Estimates for a number of countries are probably biased upwards by including hours which are paid for but not worked (presumably including paid sick and recreational leave): Canada, Germany, Iceland, Luxembourg, Netherlands, New Zealand and the USA. Nevertheless, for the remaining thirteen OECD countries, including Australia, the ILO figures appear to have been derived on a broadly comparable basis, covering actual hours of work of both full and part-time workers in the major sectors of the economy.

Fortunately, for the purposes of the Australia-Japan comparison, we have an independent source for both employment and hours. Castles (1992) cites detailed studies of the use of time in Sydney in 1987 and in four Japanese cities, including Tokyo, in 1986. The representative Sydney adult devotes 21 hours per week to labour force work, whilst their Tokyo counterpart works 30 hours. The Sydneysider's extra nine hours of leisure are divided between

housekeeping, child care leisure activities and additional sleep! Adjusting for the relatively low proportion of children in Japan, we can deduce that average weekly working hours *per capita* were 25 in Tokyo, more than fifty percent higher than the 16.6 hours *per capita* in Sydney. These estimates are very close to the 1990 estimates listed in column 3 of Table 1. Castles also notes that the average Tokyo resident spends an hour more than their Sydney counterpart commuting to and from work, so the difference in hours of work underestimates the difference in leisure time.

It does appear to be the case that Australians produce less than some other OECD countries simply because they work less. It is, then, not at all obvious that *per capita* measures of output are reliable as indicators of relative living standards. Australians may choose to work less hours in order to enjoy more leisure, whether through early retirement or long weekends at the beach. Additionally, Australians engage in more home production - of child-care and other domestic services - than some other countries. Neither leisure nor home production are recorded in National Accounts measures of GDP - so output per capita may be a very poor indicator of relative welfare in the OECD because patterns of work and leisure vary so substantially across countries.

Hourly output may be a better indicator of relative productivity, but it is not necessarily suitable as an indicator of living standards. There are three principal deficiencies. First, leisure may be involuntary, most obviously in the case of unemployment. If all Australians other than miners lost their jobs, average labour productivity would rise but welfare would fall. Second, ranking

countries' welfare by productivity implicitly assumes that the value of leisure equals the average product, since increasing output and working hours equi-proportionally does not alter the productivity index. But we know that the implicit price of leisure, the wage, is less than the average product and that labour's share in income varies considerably across countries. Third, the output measure used to construct the productivity index is still derived from constant international prices rather than from the prices actually facing consumers in any pair of countries.

The comparison procedure adopted here, based on direct comparisons of leisure/consumption bundles, deals with the second and third difficulties, but not the first. It thus tends to overstate the welfare of citizens of countries with high levels of (overt and hidden) unemployment. Overt Australian unemployment was about 6.5 per cent in 1990, so this source of bias is probably not severe.

2. Comparing prices and quantities

If we were to believe the media image of the typical Australian we would picture them as the meat-eating, beer-drinking occupant of a quarter-acre block. The corresponding image of the Japanese would be the rice-and-fish eating tenant of a tiny Tokyo apartment. The OECD data allow us to compare such images with reality. How different really are the patterns of consumption across the two countries ? Moreover, we can address the related question of whether the differences in consumption are due to inherent differences in preferences, or whether they simply represent adaptation to different price structures.

Table 3 presents price and volume indices for forty categories of expenditure which comprise GDP. The volume indices indicate quantities of consumption and investment per capita, measured relative to the OECD average which is set at 100. Asterisks indicate that the volume of consumption per capita is either the highest or lowest amongst all 24 OECD countries. The price indices are derived from the purchasing power parities for each category, with the index set at 100 for the price of GDP in that country.

At a glance it does indeed appear to be the case that consumption and investment patterns differ radically between the two countries. Australians are the biggest consumers of meat in the whole OECD, and the Japanese consume the least - less than one quarter of Australian consumption. On the other hand, the Japanese eat eight times as much fish as do Australians. Several myths are, however, dispelled - Australian consumption of alcoholic drinks is less than one half of the OECD average. Both countries are high on the index of recreational and cultural services, with Australia the highest in the OECD. We find confirmation of Japan's exceptionally high levels of investment, especially in transport and electrical equipment. Australia also invests more than the OECD average, but capital accumulation is skewed towards building, especially residential construction.

Overall consumption and investment patterns have very little in common across the two countries. The simple correlation coefficient for 38 categories of expenditure (excluding stocks and net exports) is -0.16 and the rank correlation coefficient is -0.01. Such observations are often taken as evidence that Japanese and

Australian tastes are inherently different. Whilst we cannot disprove such a claim, it is certainly instructive to see whether Australians and Japanese face substantially different relative prices. Indeed, columns 3 and 4 of Table 3 indicate that whilst Australians have the cheapest meat and oils in the OECD, the Japanese have the dearest. Both countries face relatively high prices for alcoholic drinks. Australian residential building is the cheapest within the OECD, presumably reflecting cheap land. Japan faces building costs some 40 percent higher. And Japan has the cheapest transport equipment with the OECD and also relatively cheap electrical equipment. In each of these cases we note that each country tends to have high consumption of goods which are relatively cheap, and low consumption of goods which are relatively expensive.

The overall comparison of prices in Table 3 confirms that goods which are expensive in Australia tend to be cheap in Japan, and vice versa.. The simple correlation coefficient for prices across 38 categories of goods and services is -0.33 and the rank order correlation is -0.22. Moreover, there is a clear tendency for Australian consumption to be higher than Japanese consumption where Australians face relatively lower prices. Comparing the volume ratios between the two countries (Table 3: Column 1 divided by Column 2) and the price ratios (Column 3 divided by Column 4), the simple correlation coefficient is -0.43 and the rank order correlation is -0.37. So it is possible that it is relative prices rather than different tastes which explain the differences between Australian and Japanese patterns of expenditure. Indeed, in the following section we shall look at revealed preference tests not only

in order to rank countries but also to test the hypothesis that tastes are the same across countries.

3 Revealed Preferences

When consumption patterns and prices vary so greatly across two countries as we have observed to be the case for Australia and Japan, comparing aggregate output or welfare is problematic. The standard approach is to use some set of international prices by which to value the two bundles of goods and services. So, for instance, Table 1 shows the valuations of GDP using OECD average 1990 prices. But neither Japanese nor Australian consumers face OECD prices - indeed we can see from Table 3, where the international price vector has been normalised to 100 for each commodity, that relative prices are actually very different. So valuations at OECD prices give us little information about the actual choice sets facing either Australians or Japanese.

We see, for instance, from Table 3 that Australians consume four times as much meat as do Japanese but only one eighth as much fish. Valuing aggregate consumption of food, any price vector which values meat higher than fish will obviously favour Australia over Japan, and *vice versa*. Rankings produced by any such constant price vector are inherently arbitrary, unless it happens that one country's consumption exceeds the other's for every category.

The fundamental problem with constant international price rankings is that they have no obvious welfare implications. By contrast, the revealed preference approach, as developed by Samuelson (1947) , is to value the two bundles of goods and services

first at Australian prices, then at Japanese prices. Consider first the case where the Japanese bundle is the more valuable at Japanese prices. Since we are using the actual prices facing Japanese households, we can infer that the representative Japanese could have chosen the Australian bundle. Rational choice implies that the Japanese are better off with their own bundle than with the Australian bundle.³

The next step in the procedure is to value the two bundles at Australian prices. If the Japanese bundle is again of higher value than the Australian bundle, then it does not lie within the choice set of the representative Australian. In this case we do not in general know whether or not the representative Australian would have preferred the Japanese bundle. Assuming common tastes, however, we can say that the Japanese bundle is revealed preferred to the Australian. If, however, the representative Australian could have afforded the Japanese bundle we are forced to reject the hypothesis of common tastes.

A third possibility is that the Australian bundle is the more valuable at Japanese prices but the less valuable at Australian prices. In this case neither representative individual has been observed to reject the other's consumption bundle, so the welfare levels are not comparable. A more detailed description of the revealed preference method, a critical examination of its assumptions and its extension through Varian's (1982) Generalised Axiom of Revealed Preference is found in Dowrick and Quiggin (1992). This paper applies the method

³This assumes that the representative agent treats prices as parametric and does not perceive any binding quantity constraints.

to comparisons of GDP for 60 countries in 1980, using a data set which does not include Australia.

We have carried out the 276 pairwise comparisons for the 24 OECD countries. A first set of results are presented in matrix format in Table 4. Here the quantities which are being valued cover the 40 categories comprising GDP, as listed in Table 3. We include investment, net exports and increases in stocks as proxies for the value of deferred consumption. The first row for the USA indicates with "+" signs that the US GDP bundle is revealed preferred to that for all other 23 countries. The second row for Switzerland starts with a "-" sign which confirms that the Swiss GDP is revealed inferior to US GDP, but subsequent "+" signs indicate that it is revealed preferred to all other 22 countries. Luxembourg, in the third row, starts off with a similar pattern, but "NC" in the fourth column indicates that the Luxembourg and Canadian GDP bundles are non-comparable. The only other symbols which needs explanation are ">>" and "<<" which appear in the comparisons of Turkish GDP with each of France, Austria and Australia. These symbols indicate that the Turkish bundle is strictly dominated by the other three in the sense that Turkish quantities are less in all categories (except for "increase in stocks" and "balance of exports and imports" which were omitted from the dominance test).

An interesting feature of this table is that there are two groups of countries within which pairwise rankings are generally not possible. Japan, France, Sweden, Denmark, and Austria are one such group where nine out of the ten pairwise comparisons are inconclusive. Although the OECD constant price ranking of GDP per

capita shows Japan to be clearly at the top of this group, nearly seven percentage points ahead of Austria, consumption and price patterns vary so much within this group that we can derive no clear welfare interpretation of the inter-group rankings. We can however say that these countries are less well off than the USA, Switzerland, Luxembourg, Canada and Germany (with the exception of the Japan-Germany comparison) and better off than the remaining 14 countries (excluding the Sweden-Iceland comparison).

The second group where rankings are highly ambiguous consists of Iceland, Finland, Belgium, Norway, Australia, Italy and the UK. Here 18 out of 28 pairs are non-comparable. In particular, Australia is not revealed preferred to any of the other six countries and could be placed anywhere between 11th and 17th.

The revealed preference criteria actually reverse one of the constant price rankings, that between Austria and Iceland. At international prices GDP is higher in Iceland, but at either Austrian or Icelandic prices the conclusion is overturned. Such reversals highlight the problems inherent in the use of international price comparisons.

We have repeated this exercise restricting our attention to the 32 categories of goods and services which comprise private and public consumption, excluding investment, stocks and net exports. The results are reported in Table 5. It is notable that there are significantly less non-comparabilities here than in Table 4, but there are many more reversals of the OECD price rankings. Most notably, Swedish consumption is revealed inferior to the UK despite being six percent above the UK at OECD prices.

Australian consumption ranks between 12th and 14th and is revealed preferred to Japanese consumption. Japanese consumption is ranked 17th. Of course we expect Japan to slip down the tables when its extraordinarily high investment is excluded from the comparisons. But it is interesting to note that at OECD prices Japanese consumption is valued marginally above that of Australia, a ranking which is unambiguously reversed by revealed preference criteria. In other words, OECD average prices for consumption are so much at variance with either Australian or Japanese prices that they give a clearly misleading comparison.

So far our comparisons have ignored differences in work and leisure. We have shown previously, see Table 1, that labour productivity rankings can be very different from the output *per capita* rankings. In terms of revealed preference, the question which is now being asked is whether the representative individual in Japan could have afforded the Australian bundle *with Australian hours of work and Japanese rates of pay*. In other words, is the Australian consumption/investment bundle available to the representative Japanese if they were to reduce their hours of work from 24 to 16 per week?⁴

Table 6 reports the revealed preference results when labour input is measured only in terms of numbers in employment. The value of the wage is derived by dividing the ratio of compensation of employees to GDP (from OECD National Accounts) by the ratio of employment to total population. Since the Australian employment

⁴ This comparison differs from the comparison of output per hour of work, reported in Table 1, column 9, because the opportunity cost of an hour of labour is valued not at the average product of labour but at the actual wage.

ratio is about average for the OECD, it is not surprising to see that Australia's ranking is largely unchanged. Japan, however, has a very high employment ratio and drops down the rankings but is still revealed preferred to Australia. The countries which move most dramatically up the revealed preference table, comparing Tables 4 and 6, are France, Belgium and Italy all of which are predominantly Catholic countries with low rates of female participation in the labour force. Sweden with its very high female participation rate drops down the rankings.

Taking account of hours of work produces even more changes in the revealed preference rankings as displayed in Table 7. Because the ILO data on hours of work is uneven in its coverage we do not want to place too much weight on some of these comparisons. But we have indicated that for the majority of the countries the data appear to be consistent, and in particular for the comparison of Australia and Japan we have independent confirmation of the ILO data. So it is relevant to report that the Australian consumption / leisure bundle is revealed preferred to the Japanese. The representative Australian could have afforded the Japanese bundle of consumption and investment goods if they had devoted an extra 50 percent of their time to labour market activity. But the Japanese could not have afforded the Australian consumption/leisure bundle. Indeed, Australia is now seen to be in 11th / 12th position in the revealed preference rankings with Japan in 16th to 18th place.

These findings serve as a warning that international price comparisons of GDP should be treated with caution for the purposes of comparing living standards across countries. We have shown that

Australian and Japanese patterns of consumption, investment and leisure are very different from each other and from those of many of the countries with whom we are being compared. Adjusting for these differences and using the revealed preference approach shows Australian living standards in a rather more favourable comparative light.

4. Concluding comments

We contend that the revealed preference exercise we have carried out is a much sounder basis for comparison of international living standards than the usual international price "league tables". Taking account of high Australian consumption of cheap food, land and leisure certainly has the effect of reversing the conventional view that Japanese living standards have outstripped Australian.

There are many more adjustments that one might wish to make before arriving at a definitive comparison of international living standards. Eisner (1988) and Scott (1990) discuss many of the problems inherent in the use of GDP as a measure of living standards. It would certainly be desirable, if difficult, to take account of differences in environmental conditions and to distinguish welfare enhancing consumption from protective consumption (e.g. policing services or winter clothing), and to account for differences in the quality of leisure. We suspect that Australia would tend to emerge favourably from such adjustments in comparison with many other OECD countries. It would also be desirable to take account of foreign accumulation of assets, which might well work against Australia.

Another important consideration would be to take account of inequalities in living standards within countries. The "representative" Australian may be worse off than the "representative" from the USA - but it does not follow that the Australian poor, defined perhaps as the bottom decile in the income distribution, are worse off than the poor in the USA.

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