OECD Economics Department Working Papers No. 17

Real Gross Product in OECD Countries and Associated Purchasing Power Parities

Peter Hill

https://dx.doi.org/10.1787/222684453676

OECD

General distribution

OECD 17

ECONOMICS AND STATISTICS
DEPARTMENT

WORKING PAPERS

GENERAL DISTRIBUTION

ECONOMICS AND STATISTICS DEPARTMENT

WORKING PAPERS

This series of Working Papers is designed to make available, to a wider readership, selected studies which the Department has prepared for use within OECD. Authorship is generally collective, but main individual authors are named. The Papers are available both in English and French.

Comment on the Papers is invited, and may be sent to OECD, Department of Economics and Statistics, 2 rue André Pascal, 75775 Paris Cedex 16, France. Additional copies of the Papers on a limited basis can be forwarded on request.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

25.951

REAL GROSS PRODUCT IN OECD COUNTRIES AND ASSOCIATED PURCHASING POWER PARITIES

by

Peter Hill

Economic Statistics and National Accounts Division*

This working paper constitutes a preliminary report on the OECD Purchasing Power Parity project which has been carried out in the Economic Statistics and National Accounts Division during 1983 and 1984. The project has been directed by Mr. Michael Ward as Consultant to the OECD, and a full report will be published early in 1985. The views expressed in this paper are those of the author and do not necessarily reflect those of the Organisation or its Member Governments.

CONTENTS

		Page
I.	INTRODUCTION AND SUMMARY	3
II.	THE NEED FOR INTERNATIONAL PRICE AND VOLUME MEASURES	6
III.	THE OECD PROGRAMME TO CALCULATE REAL PER CAPITA GDP IN 1980 BASED ON PPPs	11
IV.	THE BENCHMARK RESULTS FOR 1980	12
V.	THE BEHAVIOUR OF PPPs AND REAL AND NOMINAL PER CAPITA GDPs SINCE 1980	14
VI.	REAL PER CAPITA EXPENDITURES FOR PARTICULAR CATEGORIES OF EXPENDITURE	16
VII.	SPECIFIC PPPs AND PATTERNS OF RELATIVE PRICES	17

REAL GROSS PRODUCT IN OECD COUNTRIES AND ASSOCIATED PURCHASING POWER PARITIES

I. INTRODUCTION AND SUMMARY

This report contains a new set of results on the levels of real per capita GDP and its main components in OECD countries in 1980, with estimates for later years upto 1984. Real per capita GDP is obtained by valuing the goods and services in different countries at a fixed set of prices, namely, the average prices prevailing at the time within the group of countries covered. This procedure is essentially the same as that used to measure volume changes over time within a single country when the fixed prices of some base year are used to compile expenditure or output series at constant prices. The international measures of real per capita GDP for different countries can therefore be interpreted in the same way as the volume indices which are used to measure real rates of growth within a single country.

These international volume measures may be contrasted with measures of per capita GDP which are frequently obtained by converting data for different countries into a single currency unit, such as the U.S. dollar, by means of exchange rates. As explained in detail in the report, the exchange rate converted figures reflect not only differences in the quantities of goods and services produced or consumed in the different countries but also differences in price levels between countries. Price levels in different countries are not the same precisely because exchange rates do not generally reflect the relative purchasing powers of different currencies within their own countries.

Thus, per capita GDP figures converted at exchange rates are essentially nominal as distinct from real measures as they reflect differences in price levels between countries as much as volumes. Moreover, the differences in price levels are often quite large. Such data cannot therefore be used for purposes of comparisons of productivity or living standards which are meant to reflect real differences from country to country. Nor are they generally suitable for purposes of aggregation across countries because goods and services in some countries are systematically under or overvalued compared with other countries. The volume measures presented in this report have therefore been developed precisely in order to provide the additional information which is needed in order to be able to measure the real differences in expenditures between countries, not only at the level of GDP but also for sub-aggregates such as personal consumption, or even for expenditures on specific items such as food, clothing or education.

In practice, it is easier and much more cost effective to collect information about the prices in different countries than quantities. For this reason, the volume measures presented here are actually derived by deflating the expenditure data for different countries by purchasing power parities, or PPPs, in the same way that volume measures over time within a single country are mostly calculated by deflating current data by appropriate price indices.

Purchasing power parities are generically forms of price indices, because they are calculated by comparing the prices of the same commodities in different countries. However, they have the same dimensions as exchange rates in that they express the rate at which one currency may be converted into another. At the level of an individual commodity a PPP is simply the ratio of the prices of the same commodity in two different countries expressed in their own units of currency: it, therefore, shows the rate at which a given amount of one currency should be converted into the other in order to make it possible to purchase the same quantity of that commodity in both countries. Thus, a PPP is the rate of currency conversion which equalises the prices in both countries.

There is a considerable variation in the PPPs for individual commodities because patterns of relative prices vary from country to country. In order to arrive at PPPs for groups of commodities, including major aggregates upto the level of GDP, it is necessary to average the individual PPPs in such a way that the volume measures which are subsequently derived from them have the requisite properties of constant price measures.

The PPPs also have considerable interest in their own right as they make it possible to compare price levels in different countries at any moment of time. Although they have the same dimensions as exchange rates, their economic significance is, of course, quite different. While the information they provide about relative price levels may be relevant to the explanation of exchange rates, it is also obvious that exchange rates depend upon very many other factors, as the behaviour of currency markets in the last few years has amply demonstrated.

The first major study of PPPs was undertaken under the auspices of the OEEC in the early 1950's when Milton Gilbert and Irving B. Kravis produced their pioneering report on An International Comparison of National Products and the Purchasing Power of Currencies, (OEEC, 1954). In the 1960's and 1970's the main focus of this work shifted to the Statistical Offices of the United Nations and the European Communities, but in 1982 the OECD became convinced of the need to calculate a new benchmark set of PPPs for its Member countries, partly because of the large movements in the exchange rates between the currencies of some of its Member countries in the 1980's. In order to be consistent with the results already obtained by the Statistical Office of the European Communities and work in progress by other international organisations, 1980 was chosen as the year for which the basic price collection would be undertaken. Measures for years before and after 1980 can, however, be obtained by backdating or updating the PPPs on the basis of the relative rates of inflation in different countries. Thus, this report contains data upto and including 1984, although the results for 1984 must be treated as provisional.

Eighteen OECD countries are covered. The results for twelve of these countries were actually obtained by the Statistical Office of the European Communities, (see Eurostat, 1983) and the OECD has simply incorporated the Eurostat results en bloc into its own results. The OECD gratefully acknowledges the major contribution which Eurostat has made to the OECD's programme of work. The OECD's principal role has been to extend results

obtained by Eurostat for European countries to cover the larger non-European OECD countries, in particular, the United States, Canada and Japan. The OECD's results will, in turn, be incorporated into a set of world results which are being assembled by the United Nations Statistical Office. The OECD embarked on this work only at the start of 1983 and it is for this reason that results for 1980 are only now being published. Working retrospectively also imposed constraints on the OECD programme which need not have applied if the programme of work had been carefully planned in advance of the year in which the price data were collected.

The results obtained show that there are often very substantial differences between the relative sizes of nominal per capita GDPs based on exchange rates and real per capita GDPs based on PPPs, especially between countries at different levels of economic development. For example, the nominal per capita GDP of Germany in 1980 was about 5.3 times larger than that of Portugal whereas the real per capita GDP of Germany was only about 2.7 times greater. Such differences highlight the need for a set of real volume measures.

There are also very significant differences to be observed between the United States and most European countries. In 1980, the nominal per capita GDPs of a number of European countries actually exceeded that of the United States, whereas in real terms no European country (at least out of the 15 covered in this report) has yet attained the level of real per capita GDP of the United States. Thus, the nominal figures are liable to be misleading unless it is clearly understood by users that they reflect differences in price levels as well as volumes.

Moreover, the relationships between the nominal and real figures are not stable over time because exchange rates are liable to change much more rapidly, and by greater amounts, than purchasing power parities whose movements tend to be gradual and small. Thus, the relationships between the nominal and the real figures in 1984 were quite different in many cases from what they were in 1980, especially when comparing the United States and European countries. For example, in 1980 the nominal per capita GDP of Belgium was 104 per cent of the corresponding U.S. figure: by 1984, however, the Belgian figure was only 51 per cent of the U.S. figure (see Table 3 below). This dramatic fall was almost entirely due to the depreciation of the Belgian Franc against the U.S. dollar between 1980 and 1984. In real terms, the Belgian per capita GDP actually fell by less than 3 per cent vis-a-vis the United States between 1980 and 1984, from 76 per cent of the U.S. figure in 1980 to about 74 per cent in 1984.

In general, this report shows that, even within a group of relatively homogeneous countries, such as the Member countries of the OECD, the differences between nominal and real per capita GDPs can be both large and variable. Thus, nominal figures based on exchange rates do not provide the information which many users seek to obtain about real differences in productivity or living standards and need to be supplemented by volume measures of the kind presented in this report. This is the basic justification for undertaking this kind of work.

Finally, it should be noted that comparisons between countries need not be confined to GDP. Some analysts are interested in comparing real rates of investment, for example, or real rates of expenditure on health or education, or even real rates of defence expenditures. Because patterns of relative prices vary from country to country, each separate category of expenditure has its own specific PPP associated with it which may vary significantly from a global PPP at the GDP level. The final section of this report presents summary results for detailed categories of expenditure which confirm the existence of a considerable amount of variation in the detailed, specific PPPs. In general, a programme to calculate PPPs generates a great deal of information about patterns of relative prices in different countries which is interesting in its own right as well as being needed whenever real rates of expenditure on particular types of goods and services in different countries have to be analysed.

II. THE NEED FOR INTERNATIONAL PRICE AND VOLUME MEASURES

When the OECD publishes statistics for its Member countries they are intended, so far as possible, to be based on the same underlying concepts and definitions and to be measured in similar ways so that meaningful comparisons can be made between countries. Because of the importance of National Accounts for macro-economic analysis and policy making a special "standardised" system was created by the OEEC in the early 1950's and developed, in conjunction with other international organisations, over subsequent decades in order to ensure that major economic aggregates published for different countries all have the same meaning and economic significance.

In order to compare output or expenditure data for different countries, however, it is not sufficient to ensure that the underlying concepts and definitions are the same: it is also necessary to convert values expressed in different currency units inter a common unit of currency, or numeraire. The United States dollar has been traditionally used for this purpose (although any other currency unit would serve equally well in principle). Until recently the data for different countries have almost always been converted into U.S. dollars using market exchange rates, these being the only currency convertors available in practice.

When the GDP figures for different countries are all converted into U.S. dollars at current exchange rates, it may be natural to assume that they are all automatically comparable with each other. In one sense, this has to be true simply because the data are all expressed in current U.S. dollars, but it is also easy to overstate the extent to which the data are comparable. Thus, the fact that the data are all expressed in U.S. dollars in no way implies that the data for different countries are being valued consistently from one country to another. In particular, the data are obviously not measured at the same set of prices, not even at U.S. prices.

Consider the prices of individual goods and services in the various Member countries of the OECD in a given year such as 1980, the base year for

the calculation of the most recent set of Purchasing Power Parities, or PPPs, in the OECD area. Suppose that all these prices are then converted into dollars using 1980 exchange rates so that they are all expressed in the same unit of currenty. Two results may then be observed. First, the patterns of relative prices can be seen to vary significantly from country reflecting different demand and supply conditions in different countries. Secondly, however, and much more important in the present context, it will be observed that, on average, prices are significantly higher in some countries than others. While there are the inevitable index number problems involved in comparisons of price levels between countries, because individual goods and services are not equally important in all countries, it nevertheless remains true that, whatever weights are attached to individual goods and services, price levels are generally not the same in different countries.

For example, if we take the prices of the goods and services which make up final domestic expenditures inside Germany in 1980 and convert them into U.S. dollars using the 1980 exchange rate between the U.S. Dollar and the Deutsche Mark, we find that, on average, they were about 40 per cent higher than the dollar prices of the corresponding goods and services inside the United States. (It must be remembered, however, that 1980, the base year chosen for the comparisons, happens to have been the year in which the exchange rate of the U.S. dollar reached its lowest point against most other major currencies) Differences in price levels of this magnitude are in no way ususual and can frequently be observed between countries in most periods of time. Movements in exchange rates will automatically tend to change relative price levels between countries, but neither economic theory nor empirical evidence suggests that movements in exchange rates will operate in such a way as to tend to eliminate, or even attenuate, the dispersion in price levels between countries.

The existence of large and persistent differences in price levels, expecially between developed and developing countries, has been exhaustively documented by Professors Kravis, Heston and Summers (1982) in their work on the United Nations International Comparisons Project. The OECD work confirms the existence of substantial, and fluctuating, differences in price levels among its own Member countries.

Given the existence of these differences in price levels, it follows that when the GDPs of different countries are converted into a common currency using exchange rates, the figures for different countries must reflect not only differences in the quantities of goods and services produced but also differences in price levels. The situation is analogous to comparing the GDP of the United States in 1975, at 1975 prices, with the GDP of the United States in 1980 at 1980 prices. The latter figure is nearly 70 per cent higher than the former, but it is obvious to everyone that this increase is only partly attributable to an increase in the volume of goods and services produced (about 18 per cent between 1975 and 1980) and that it mainly reflects a rise in prices (of about 43 per cent between 1975 and 1980).

Unfortunately, however, many users of international statistics do not seem to have the same perception when comparing data for different countries relating to the same period of time. Reverting to the example of Germany, the

per capita GDP in Germany in 1980, when converted into U.S. dollars at the average exchange rate prevailing in 1980, was about 16 per cent higher than that of the United States. Because the data for both countries are expressed in the same current U.S. dollars, it is tempting to conclude from a comparison of this kind that productivity and living standards were, in fact, higher in Germany than in the United States in 1980. Many commentators at the time did indeed draw such conclusions and it was not uncommon for observers to remark that a number of European countries, and not simply Germany, had managed to "overtake" the United States. However, as already noted, the prices of goods and services inside Germany in 1980 when converted into dollars at the current exchange rate were about 40 per cent higher, on average, than the corresponding dollar prices inside the United States. Taking this factor into account, the volume of goods and services produced per head of population in Germany was actually about 18 per cent below that in the United States.

Thus, when comparing the per capita GDPs of different countries using market exchange rates it has to be clearly recognised that, in general, the differences observed between countries reflect both differences in the volumes of goods and services and differences in price levels. Moreover, the differences in price levels are not only often substantial but are capable of completely dominating the volume differences, as in the example of Germany and the United States in 1980.

The meaning of exchange rate converted data is perfectly clear therefore. They are essentially nominal values whose differences reflect differences in price levels as well as volumes from one country to another. They must not, therefore, be interpreted as reflecting differences in volumes only.

Unfortunately, however, many users have turned to these statistics precisely because they are interested in making real comparisons of productivity or living standards between countries and the exchange rate converted data have been the only international statistics available for this purpose until recently. In order to satisfy the needs of these users, however, it is necessary to compile genuine volume measures, in much the same way that it is necessary to compile volume measures in order to measure real rates of growth and productivity over time within a single country. Volume measures are also needed when data are aggregated across countries to obtain totals for groups of countries if the goods and services produced or consumed in different countries are not to be systematically under or overvalued in some countries compared with others.

In order to obtain international volume measures exactly the same methodology can be followed as that used to obtain volume measures over time for a single country. The goods and services produced in different countries can be revalued at a common set of international prices, in the same way that data for a single country are revalued at the fixed prices of some base year in order to calculate volume indices, rates of growth, and so on.

The use of a common set of international prices has the advantage that the data are easy to interpret, especially since most users are already familiar with this type of data from the national accounts of individual countries. There are also other advantages which constant price data possess, such as additive consistency and transitivity, which are not shared by many other measures which have been proposed for international comparisons.(1)

The volume measures for OECD countries which are presented in this report are based on average prices prevailing within the entire group of countries covered during the period in question. As most OECD countries have been covered, these prices approximate fairly closely to the average prices prevailing within the developed industrialised countries of the world. These averages are obtained simply by converting the values of the expenditures on a given commodity in all the different countries into dollars and then dividing the total dollar value of these expenditures by the total quantity of the commodity consumed in the group as a whole. The expenditures are converted into dollars using purchasing power parities rather than exchange rates.(2)

The volume measures which are derived are bound to be influenced to some extent by the set of international prices which are chosen, just as volume measures over time for a single country are influenced by the choice of base year. These "index number" problems cannot be avoided, however, when compiling volumes, or price, measures, whether over time, or space. The prices used in the OECD comparisons are the ones which appear to be the most economically relevant, namely the average prices prevailing within the OECD area during the period of time to which the volume measures relate.

In order to distinguish the volume measures based on a common set of average international prices from the corresponding "nominal" values based on exchange rates, it is natural to refer to the volume measures as "real" values, again by analogy with inter-temporal measures where the distinction between "nominal" and "real" movements over time is well understood.

When real measures are available in conjunction with the corresponding nominal measures, implicit price measures are automatically defined. In an international context, one such implicit price measure is obtained by dividing the ratio of the nominal values of GDP for two countries (converted into the same currency unit using current exchange rates) by the corresponding volume index as defined above. The resulting price index measures the ratio of the price levels of the two countries, when prices in both countries are converted into the same currency unit by means of current exchange rates. This is the kind of index referred to earlier when the example of Germany was used to illustrate the fact that prices inside Germany in 1980, when converted into dollars by means of the exchange rate, were about 40 per cent higher, on average than those inside the United States in 1980.

There is, however, a second kind of implicit price deflator which can be defined in an international context. This is obtained by dividing the ratio of the nominal GDPs in two countries, expressed in their own national currencies, by the corresponding volume index. The result in this case is not a price index as normally understood, but what is called a "purchasing power parity". This does not have the dimensions of a price index because it expresses the rate at which units of one currency are to be converted into another currency. In other words, it has the dimensions of an exchange rate rather than a price index.

The PPP rate has a special property, namely that it is that particular rate of currency conversion which ensures that the resulting price levels in the countries compared are about the same on average. That is, if the prices in one country are converted into the currency of the other using the PPP rate instead of the exchange rate, no systematic differences will be observed

between the price levels in the two countries. This explains the use of the expression "purchasing power parity". For example, consider the value of some specified set of goods and services in one country: if that value is converted into the currency of another country using the PPP rate, it follows that the resulting sum of money should be sufficient to purchase an equivalent set of goods and services in the second country. Because of differences in relative prices between the two countries, the two sets need not be absolutely identical, but they should be very similar and serve the same purposes.

A PPP has to be defined with reference to some set of goods and services. The most general PPP, and one which is used extensively in international comparisons, is that which refers to the set of goods and services which make up all final expenditures. When a somewhat smaller set is chosen, such as the goods and services which enter into personal or individual consumption, a slightly different PPP will emerge. This is bound to occur whenever the pattern of relative prices is not the same from country to country, as invariably happens in practice. This situation is essentially no different from that observed in the case of price indices over time within a single country where the movements in a consumer price index, for example, will not generally be the same as those of a producer price index (or GDP deflator).

Finally, although PPPs are in principle, by-products of real and nominal comparisons among a group of countries, in practice, PPPs are usually calculated directly from price observations collected in the various countries. It is well known that price ratios, whether between two periods of time or between two countries, display less variability than the corresponding quantity ratios, so that it is almost invariably more efficient, taking account of the costs and practical difficulties of the actual data collection, to estimate the relevant price measures directly even when the ultimate objective is to arrive at volume measures. PPPs can easily be calculated at the level of an individual commodity simply by designating a carefully specified commodity, collecting a sample of the prices (denominated in their own national currencies) of that commodity in each of the different countries and then forming the ratios of one average national price to another. For example, average national prices may be collected for a kilo of granulated white sugar in different countries whose ratios then constitute the PPPs for this particular type of sugar. These price ratios, or elementary PPPs, vary from commodity to commodity, of course, because of differences in the patterns of ralative prices within a group of countries. In order to arrive at PPPs for groups of commodities, or aggregates such as personal or individual consumption, the elementary PPPs have to be averaged following procedures which will ensure that the final volume measures, which are eventually obtained by applying the average PPPs to expenditure data denominated in national currencies, have the requisite properties outlined above of constant price measures. The actual procedures followed in the OECD programme are explained in detail in the forthcoming OECD publication on Real Per Capita GDPs, and Purchasing Power Parities. They are also described in other texts.(3)

III. THE OECD PROGRAMME TO CALCULATE REAL PER CAPITA GDP IN 1980 BASED ON PPPs

The OECD programme of work on real per capita GDP and PPPs started at the beginning of 1983. At that point, results for 1980 had already been published for 12 European OECD countries by the Statistical Office of the European Communities, or Eurostat. It had also become clear by that point that results for other OECD countries would not be forthcoming from any other source. The OECD therefore decided to extend the Eurostat results to include at least the larger non-European OECD countries. Given the limited time and resources available it was possible to cover only four countries, the United States, Canada, Japan and Norway.

The OECD was obliged to work retrospectively, which largely, but by no means entirely, restricted the data used to price observations already on file for 1980 in the national statistical offices of the four countries concerned. Moreover, the data already on file were not collected in the knowledge that they might subsequently be used for purposes of international comparisons, which sometimes made it very difficult to extract the requisite data in the appropriate form.

Technical difficulties were encountered with the prices of consumer goods in the United States where the new method of calculating the U.S. Consumer Price Index introduced in 1978 made it difficult, and sometimes impossible, to calculate the average national prices which ideally are required for the calculation of purchasing power partities. It was therefore necessary to resort to special procedures whereby prices in three major U.S. cities, New York, Chicago and Seattle, were systematically compared with prices in three equivalent Canadian cities, namely Montreal, Toronto and Vancouver. In this way a link was established between U.S. consumer prices and Canadian consumer prices, and through Canada with consumer prices in other OECD countries. However, these problems did not arise for capital goods or government services where the methods used for the United States were the same as in all other countries.

For all the reasons just given, the quality of results which the OECD was able to obtain for 1980 for the four additional countries may not always be so good, at least for certain items in certain countries, as would be desirable and possible when the programme of work is worked out carefully in advance of the year to which the exercise relates. This comment does not apply, however, to the 12 OECD countries covered by Eurostat where such careful advance planning did take place.

Nevertheless, the results obtained for the four additional countries are considered to be statistically robust, especially at an aggregative level such as GDP as a whole. A much more detailed explanation of the methods used in the OECD work will be given in the forthcoming publication setting out the full OECD results for 1980.

Results are also available for a further two OECD countries in 1980 from quite a different source. Under the auspices of the United Nations Economic Commission for Europe, Austria acted as a link, or bridge-country

between the 12 countries covered by Eurostat and the so-called European Group 2 countries, which are mostly in Eastern Europe but also include Finland. It has, therefore, also been possible to add Austria and Finland to the group of OECD countries for which results are available for 1980.

IV. THE BENCHMARK RESULTS FOR 1980

Summary results for 1980 for the 18 countries covered by the 1980 OECD PPP programme are presented in Table 1. The first column shows the traditional nominal GDP per capita figures converted into U.S. dollars using the average exchange rates for 1980. Nominal figures of this kind have always been regularly published in Volume 1 of the OECD's annual National Accounts publication.

The figures in the second column of Table 1 show the real GDP per capita figures for 1980 obtained by utilising a fixed set of prices, in effect average OECD prices, to value the goods and services produced in the different countries. In order to preserve comparability with the nominal figures, the real figures are also expressed in U.S. dollars by scaling the average prices used in such a way that the value of total U.S. GDP is the same whether expressed in the actual U.S. prices of 1980 or in average OECD prices. In principle, any other country could be used as the reference country for purposes of comparison between the figures in the first two columns: the choice of the United States is purely a matter of convenience and no special weight is attached to U.S. prices or quantities.

The difference between the two sets of figures are quite striking. Because the exchange rate for the U.S. dollar was exceptionally low in 1980, compared both with earlier and later years, U.S. per capita GDP also appeared exceptionally low compared with the per capita GDPs of other countries converted at 1980 exchange rates. The U.S. actually ranked eighth out of the countries shown in terms of nominal per capita GDP in 1980, a result which many users found puzzling when these data were first published. The volume figures in column (2) show quite a different picture with the United States reinstated as head of the list. However, the differences between the two sets of figures by no means all stem from the low dollar exchange rate in 1980. The figures also exhibit a general tendency already well documented by Kravis and his colleagues at a world level; namely, the gap between richer and poorer countries can be seen to be much less in real terms than it appears in nominal terms. This is clearly the case within Europe. For example, in nominal terms the per capita GDP of Germany in 1980 was 5.3 times greater than that of Portugal, whereas in volume terms it was only 2.7 times greater. As another example, the per capita GDP of France in nominal terms was 2.9 times that of Greece, whereas in real terms it was only 1.9 times greater. Thus, the nominal and the real figures tell a very different story, and there is no doubt that the nominal figures can be very misleading if they are interpreted as measuring differences in productivity or living standards between countries.

Table 1

BENCHMARK RESULTS FOR 1980 (a)

	Per capita GDP in US dollars		Ratio of national price level in dollars(b) to the US price level (c)	Average exchange rate	Purchasing power parity for GDP
	Nominal measure based on exchange rates	Volume measure based on internat. prices			
	(1)	(2)	(3)	(4)	(5)
United States..	11450	11450	100	1.00	1.00
Canada.....	10760	11430	94	1.17	1.10
Japan.....	8910	8140	109	227	248
Austria.....	10270	8040	128	12.9	16.5
Belgium.....	11880	8700	137	29.2	39.7
Denmark.....	12940	9060	143	5.64	8.06
Finland.....	10480	7700	136	3.73	5.08
France.....	12180	9010	135	4.23	5.69
Germany.....	13240	9400	141	1.82	2.57
Greece.....	4170	4700	89	42.6	38.4
Ireland.....	5250	5050	104	0.487	0.500
Italy.....	7000	7180	97	856	824
Luxembourg.....	12670	9790	129	29.2	37.5
Netherlands....	11970	8590	139	1.99	2.74
Norway.....	14120	10280	137	4.94	6.79
Portugal.....	2480	3530	70	50.1	34.4
Spain.....	5660	5860	97	71.7	69.1
United Kingdom.	9390	7610	123	0.430	0.528

(a) The GDP figures for EEC countries shown in this table are those used to calculate the Eurostat results for 1980. They have subsequently been revised for a number of EEC countries.
(b) Price level in dollars converted at average 1980 exchange rate.
(c) Col(3)=(Col(1)/Col(2))x100.

The figures in column (3) of Table 1 show the differences in national price levels which are implicit in a comparison between the nominal and real figures shown in columns (1) and (2). As already remarked, prices inside Germany, for example, when converted into dollars at the 1980 exchange rate, were approximately 40 per cent higher, on average, than the corresponding prices inside the United States, and this is shown by the figures of 141 for Germany in the third column of Table 1. In general, it can be seen that, in 1980, prices inside the United States were low in comparison with prices inside most European countries, which simply reflects the low value of the U.S. dollar on foreign exchange markets in 1980. Prices in the United States were only slightly lower than in those inside Japan, however, so that prices in Japan were also relatively low compared with most European countries.

Prices were not high in all European countries, however, compared with the United States. The fact that the gap between the per capita GDP of rich and poor countries tends to be smaller in real than nominal terms itself reflects a general tendency for prices inside poorer countries (when converted at current exchange rates) to be lower than those in richer countries. This tendency is sufficiently strong that, notwithstanding the low value of the dollar in 1980 against most European currencies, U.S. prices were not actually lower than those in the OECD countries with the lowest per capita GDPs, such as Portugal and Greece.

The final two columns of Table 1 compare exchange rates and PPPs in 1980. As already stated, PPPs are essentially those rates of currency conversion which are needed in order to ensure that price levels in the different countries are brought into approximate equality. The differences between the PPPs and the corresponding exchange rates have already been anticipated by the previous discussion about the differences between real and nominal per capita GDPs as they depend upon the same factors. It will be evident from what has already been said that, in 1980, the exchange rate of the dollar against most European currencies was lower than the corresponding PPP, which is simply another way of expressing the fact that prices inside the U.S. were generally less than the corresponding European prices when converted into dollars at current exchange rates. There is little, therefore, which can usefully be added to the previous discussion about the differences between real and nominal per capita GDPs.

Although PPPs are currency convertors and have the same dimensions as exchange rates, they are not, of course, to be interpreted as norms or equilibrium values for exchange rates. While levels of relative prices in different countries may have some influence on exchange rates, there are very many other factors as well which enter into the determination of exchange rates, as the experience of currency markets in the 1980's has clearly shown. Quite apart from the powerful theoretical objections to the notion that purchasing power parities can be interpreted as equilibrium exchange rates, the empirical evidence which has been accumulated at a world level over the last fifteen years by Prof. Kravis and his colleagues (1982) demonstrates quite clearly that the deviations between exchange rates and purchasing power parities, especially between countries at different levels of economic development, can be both substantial and persistent and can in no sense be regarded as temporary aberrations which market forces will tend to correct.

However, it is also clear that the relationship between PPPs and exchange rates are not stable over time, especially under a regime of floating exchange rates. PPPs tend to change slowly and smoothly from year to year in response to differential rates of inflation, whereas recent experience has shown that exchange rates are capable of fluctuating quite considerably, even over relatively short periods of time. For these reasons, the relationships between PPPs and exchange rates, and hence between real and nominal per capita GDPs, have changed quite significantly in the OECD area since 1980, the base year for the PPP calculations, so that it is necessary to examine how the situation in 1984 differs from that in 1980.

V. THE BEHAVIOUR OF PPPs AND REAL AND NOMINAL PER CAPITA GDPs SINCE 1980

The calculation of a set of benchmark PPPs and associated real per capita GDPs is a major operation involving the collection of very detailed information on prices and final expenditures in all the countries concerned. While there would be some advantages and economies in carrying out such calculations on a regular annual basis, at the present time benchmark data are calculated only once every five years. The OECD therefore is planning to carry out a second set of benchmark calculations for 1985 in collaboration with Eurostat and other international organisations.

It is also possible, however, to calculate PPPs for the years preceding or following the benchmark year by using information about the relative rates of inflation in the different countries. Alternatively, the real per capita GDPs could be calculated directly by using information on relative rates of real growth. The procedure is relatively simple whichever method is followed, and both methods should lead to the same results, given that the GDP growth rates and price deflators are mutually consistent with each other. For example, the GDP PPP for Germany in 1982 can be calculated by taking the benchmark figure for 1980 and adjusting it for the relative rates of inflation in Germany and the United States between 1980 and 1982. If p_G denotes the percentage increase in the GDP price deflator for Germany between 1980 and 1982 and p_{US} that for the United States, then the German PPP for 1982 is given by:

$$PPP_{82} = PPP_{80} \frac{(1+0.0p_G)}{(1+0.0p_{US})}$$

In actual numbers, we have

$$2.41 = 2.57 \frac{(1.091)}{(1.164)}$$

as the GDP price deflator increased by 9.1 per cent in Germany and 16.4 per cent in the United States. Obviously, if the rates of inflation in two countries are the same the PPP remains unchanged. Once an updated PPP has been calculated, the corresponding real GDP figure can be readily derived for the year in question.

Table 2

ESTIMATED GDP PPP's AND EXCHANGE RATES 1970-1984

(National currency units per US dollar)

	1970(a)	1973	1977	1980	1981	1982	1983	1984(b)
UNITED STATES.....PPP	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Exch.rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CANADA.....PPP	0.89	0.91	1.07	1.10	1.11	1.16	1.17	1.17
Exch.rate	1.05	1.00	1.06	1.17	1.20	1.23	1.23	1.32
JAPAN.....PPP	242	258	286	248	232	223	216	209
Exch.rate	360	272	269	227	221	249	238	238
AUSTRIA.....PPP	17.5	18.6	18.2	16.5	16.0	16.1	16.1	16.1
Exch.rate	26.0	19.6	16.5	12.9	15.9	17.1	18.0	19.5
BELGIUM.....PPP	39.3	40.6	44.7	39.7	38.0	38.4	38.6	38.9
Exch.rate	50.0	39.0	35.8	29.2	37.1	45.7	51.1	56.7
DENMARK.....PPP	6.29	7.04	8.06	8.06	8.12	8.47	8.78	8.90
Exch.rate	7.50	6.05	6.00	5.64	7.12	8.33	9.15	10.21
FINLAND.....PPP	3.38	3.89	5.14	5.08	5.18	5.32	5.56	5.75
Exch.rate	4.20	3.77	4.12	3.73	4.32	4.82	5.57	5.90
FRANCE.....PPP	4.48	4.67	5.34	5.69	5.82	6.17	6.51	6.74
Exch.rate	5.55	4.45	4.91	4.23	5.44	6.57	7.62	8.55
GERMANY.....PPP	3.03	3.15	2.89	2.57	2.44	2.41	2.40	2.33
Exch.rate	3.66	2.67	2.32	1.82	2.26	2.43	2.55	2.78
GREECE.....PPP	20.7	23.1	31.0	38.4	42.0	49.7	55.8	63.8
Exch.rate	30.0	29.6	36.8	42.6	55.4	66.8	88.1	110.3
IRELAND.....PPP	0.270	0.337	0.449	0.500	0.536	0.586	0.603	0.625
Exch.rate	0.417	0.408	0.573	0.487	0.621	0.705	0.805	0.909
ITALY.....PPP	406	444	659	824	889	989	1096	1221
Exch.rate	625	583	882	856	1137	1353	1519	1716
LUXEMBOURG.....PPP	36.1	36.3	39.8	37.5	36.9	37.5	39.1	40.2
Exch.rate	50.0	39.0	35.8	29.2	37.1	45.7	51.1	56.7
NETHERLANDS.....PPP	2.55	2.82	3.02	2.74	2.64	2.63	2.57	2.52
Exch.rate	3.62	2.80	2.45	1.99	2.50	2.67	2.85	3.15
NORWAY.....PPP	5.91	6.22	6.66	6.79	7.05	7.31	7.54	7.71
Exch.rate	7.14	5.77	5.32	4.94	5.74	6.45	7.30	7.99
PORTUGAL.....PPP	15.5	16.5	25.6	34.4	37.2	42.9	49.4	60.2
Exch.rate	28.8	24.7	38.3	50.1	61.5	79.5	110.8	143.7
SPAIN.....PPP	33.1	37.5	55.1	69.1	71.7	76.8	78.2	81.8
Exch.rate	70.0	58.3	76.0	71.7	92.3	109.9	143.4	157.9
UNITED KINGDOM.....PPP	0.278	0.304	0.442	0.528	0.538	0.544	0.552	0.549
Exch.rate	0.417	0.408	0.573	0.430	0.498	0.572	0.659	0.737

(a) 1970 marks the last year of the era of mostly fixed exchange rates.
(b) The mid-year (30 June) current official rate has been taken as the 1984 exchange rate.

Table 3

N O M I N A L A N D R E A L P E R C A P I T A G D P 's

1 9 8 0, 1 9 8 2, a n d 1 9 8 4

	Nominal per capita GDP based on exchange rates			Real per capita GDP based on PPPs			Ratio of the national price level in $ (a) to US price level		
	1980	1982	1984	1980	1982	1984	1980	1982	1984
United States.	100	100	100	100	100	100	100	100	100
Canada.....	94	93	85	100	98	95	94	94	89
Japan.....	78	68	66	71	76	75	109	90	88
Austria.....	90	67	56	70	71	67	128	94	83
Belgium.....	104	65	51	76	78	74	137	84	69
Denmark.....	113	84	70	79	83	81	143	102	87
Finland.....	92	78	67	67	70	69	136	110	97
France.....	106	76	59	79	81	75	135	94	79
Germany.....	116	81	66	82	82	79	141	99	84
Greece.....	36	30	22	41	40	38	89	74	58
Ireland.....	46	39	31	44	46	45	104	83	69
Italy.....	61	47	41	63	64	57	97	73	71
Luxembourg....	111	70	54	86	85	76	129	82	71
Netherlands...	105	73	55	75	74	69	139	99	80
Norway.....	123	104	86	90	92	89	137	113	96
Portugal.....	22	18	13	31	33	30	70	54	42
Spain.....	49	36	27	51	52	52	97	70	52
United Kingdom	82	65	49	66	68	66	123	95	74

(a) Price level in dollars converted at the current exchange rate.

As the updating, or backdating, procedures appear superficially rather simple, it may be queried why it is necessary to recalculate benchmark PPPs every five years or so. The reasons are similar to those which require temporal indices to be rebased periodically. First, the weighting patterns underlying the PPPs and the temporal price deflators are not the same, so that updated PPPs cannot be completely consistent with corresponding benchmark PPPs because the underlying formulae are not algebraically identical with each other. Second, prices indices are inevitably subject to error and the cumulative errors in updated PPPs must eventually become unacceptable if the updating is carried on indefinitely.

PPPs updated and backdated for the years preceding and following 1980 are shown in Table 2. Although the results for the period 1980 to 1984 are of more topical interest, data are also given for a selection of years back to 1970. Table 2 also shows the average exchange rates in the same years, except for 1984 where the exchange rate refers to the middle of the year.

The data in Table 2 show clearly the point which has been repeatedly emphasised in this report, namely that 1980, the base year chosen for the calculation of the benchmark PPPs, also happens to have been the year in which the exchange rate of the U.S. dollar against the main European currencies reached its lowest point for several years. Not surprisingly, therefore, the exchange rate of the dollar had fallen below the corresponding GDP PPP for most European countries. It is for this reason, of course, that prices inside the United States in 1980 were lower than the corresponding prices inside most European countries when the latter were converted into U.S. dollars at 1980 exchange rates, so that the nominal per capita GDP of the United States was also lower than that of several European countries despite the fact that, in real terms, U.S. per capita GDP was actually higher (see Table 1 above).

Between 1980 and the middle of 1984 the U.S. dollar appreciated considerably against most European currencies, in some cases doubling its value. Thus, by the middle of 1984 the dollar exchange rate was higher than the corresponding GDP PPP for every European country covered, especially those with relatively low real per capita GDPs, such as Portugal or Greece.

For these reasons, the relationships between nominal and real per capita GDPs observed in 1980 between European countries and the United States were completely reversed by 1984. This can be seen from the data in Table 3 which shows nominal and real per capita GDPs, relatively to the United States, in 1980, 1982 and 1984. As the GDP data for 1984 are inevitably only very provisional unofficial estimates, these data are presented in the form of indices based on the United States.

In 1984, as in 1980, there are substantial differences between nominal and real per capita GDPs relatively to the United States, but in 1984 the nominal figures converted at exchange rates are consistently lower than the real figures based on PPPs, whereas in 1980 the reverse applied for many European countries. In one case, Portugal, the nominal figure for 1984 is actually less than a half of the corresponding real figure. Even for a country like Germany with relatively high per capita GDP, the nominal figure is over 15 per cent below the corresponding real figure.

The relationships between the nominal and per capita GDP figures for Japan and the United States have been somewhat different from those for most European countries. Neither in 1980 nor in 1984 were the differences between the nominal and real figures for Japan nearly so great as for most European countries. In 1980 the nominal per capita GDP of Japan, relatively to the United States, was just under 10 per cent larger than the corresponding real figures, whereas in 1984 it was just over 10 per cent smaller. This reflects the fact that although the dollar also appreciated against the yen between 1980 and 1984, the extent of the appreciation was much smaller than its appreciation against most European countries.

Two general conclusions may be drawn from observing the relationships between nominal and real per capita GDPs in OECD countries over the last five years. The first is simply that in any given year the discrepancies between the nominal and the real figures may be very large with one figure upto twice as large as the other, even among a relatively homogeneous group of countries such as the OECD. The second is that the relationships between nominal and real figures are not very stable over time, because exchange rates are liable to fluctuate significantly over fairly short periods of time whereas purchasing power parities tend to change slowly and gradually, especially when there is not too much dispersion in rates of inflation in the group of countries covered. Thus, if measures of relative volumes are needed for different countries for any purpose it is clear that there can be no guarantee that they will be even roughly approximated by converting current values in national currencies by means of exchange rates.

VI. REAL PER CAPITA EXPENDITURES FOR PARTICULAR CATEGORIES OF EXPENDITURE

Upto this point, this report has been mainly concerned with real per capita GDP and its associated PPP. Although GDP is important there is also interest in comparing smaller aggregates such as personal consumption, government consumption and gross fixed capital formation. Indeed, there is considerable interest in comparisons of certain specific types of expenditures, sometimes quite detailed expenditures. For example, there is demand for information on real rates of defence expenditure in different countries: while it is particularly difficult to make price comparisons in this field, the alternative of comparing current rates of defence expenditure converted at official exchange rates is liable to produce quite misleading results, as this report has already shown. Some analysts are interested in real rates of expenditure on education in different countries: others are interested in real expenditures on health: others are interested in real rates of expenditures on research and development. And so on.

A breakdown of real final domestic expenditures into 13 different components is given in Table 4. It should be noted that these figures are not derived by applying a single, global GDP PPP to all the different expenditures within a country. The figures shown are proper volume measures obtained by valuing the goods and services within each category of expenditure at the average international prices of those goods and services. For example, the real rates of expenditure on clothing and footwear are based on the average

Table 4

1980 REAL VALUES PER CAPITA (at average international prices) (a)

	United States	Canada	Japan	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Luxem-bourg	Nether-lands	Norway	Portugal	Spain	United Kingdom
INDIVIDUAL CONSUMPTION.....	7524	7231	4614	5192.	5543	5340	4293	5667	5991	3287	3406	4756	6065	5417	4797	2681	4219	4861
FOOD, BEVERAGES, AND TOBACCO..	1241	1359	741	1089	1317	1229	974	1341	1250	1162	836	1406	1213	1336	1139	1051	1395	999
CLOTHING AND FOOTWEAR.....	554	538	317	472	407	281	297	357	564	306	224	417	337	478	334	236	430	403
GROSS RENTS, FUEL, AND POWER..	1458	1374	664	841	822	1120	824	871	882	290	399	768	1085	762	939	493	455	884
HOUSEHOLD EQUIP. AND OPERATION	552	561	309	340	715	501	314	520	687	234	227	333	536	533	350	171	372	331
MEDICAL CARE.....	629	605	819	559	528	538	566	696	556	213	339	328	425	602	716	239	346	437
TRANSPORT AND COMMUNICATION...	1658	1217	524	791	719	762	622	780	966	485	323	530	1230	616	584	202	483	547
RECREATION AND EDUCATION.....	563	581	472	253	305	457	242	354	473	239	454	285	209	480	316	113	287	469
MISCELLANEOUS GOODS & SERVICES	871	997	770	867	730	452	454	750	614	358	595	689	1030	609	420	176	451	791
COLLECTIVE CONSUMPTION OF GOVT..	1690	1185	904	991	1371	2072	1243	1291	858	631	814	1029	1296	1296	2063	707	487	1593
GROSS FIXED CAPITAL FORMATION...	2322	2867	2633	2073	1976	1767	2055	2098	2347	1030	1328	1375	2523	1741	2522	494	1204	1119
CONSTRUCTION.....	1069	1524	1588	1246	1360	1101	1397	1243	1407	768	752	900	1593	1023	1574	290	784	462
MACHINERY AND EQUIPMENT.....	1253	1344	1245	827	616	666	658	854	940	263	576	475	930	718	948	204	420	657
GROSS DOMESTIC PRODUCT.....	11447	11426	8136	8043	8695	9059	7698	9012	9400	4697	5050	7176	9792	8585	10276	3532	5855	7605

(a) The average international prices are denominated in US dollars by making the value of the total US GDP measured at average international prices equal to its actual value in 1980 US dollars.

international prices of items of clothing and footwear. It follows that each type of real expenditure has its own specific PPP associated with it. These specific PPPs will be considered in the next section.

It should be noted that the estimated volume measures for individual items of expenditure may not always be so reliable as those for broad aggregates. It is not merely that the estimate PPPs for some detailed categories of expenditure are inevitably subject to error but also that the decomposition of the current price data for broad aggregates such as personal consumption into very detailed expenditure categories presents problems in practice, even for countries as statistically developed as OECD Member countries.

It should also be noted that in Table 4 all expenditures on health have been included in "individual consumption" even if paid for by general government. As the proportions of health expenditures paid for directly by general government vary a great deal from country to country as a result of differing institutional arrangements, all expenditures on health have been grouped together in order to improve the international comparability of these statistics. For this reason, the "collective consumption of government" shown in Table 4 covers education, public administration and defence. The volume measures for collective consumption are based largely on input prices, i.e., on the wage rates of the personnel employed, in much the same way as the corresponding volume measures over time within a single country are compiled. Finally, it should be noted that the figures in Table 4 refer to 1980 only. It is technically possible to update such figures but difficult in practice because of the need for very detailed temporal price indices.

The figures in Table 4 are largely self-explanatory but a few comments are appropriate. For example, the data show that the pattern of individual consumption per capita can sometimes diverge significantly from that of per capita GDP. The best example is Norway which had the highest per capita GDP of all the European countries shown in 1980, whereas no fewer than eight European countries had higher levels of individual consumption per capita than Norway. The explanation is that in 1980 Norway had a relatively high rate of capital formation, especially in construction, a high rate of collective consumption and also a large trade surplus. Another country with a relatively low per capita consumption compared with its per capita GDP is Japan because of its high rate of real capital formation. Thus, real per capita GDP is not always a good indicator of relative living standards.

At a more detailed level, the figures sometimes may call for further explanation. The low consumption of food, beverages and tobacco in Japan, for example, reflects a different pattern of consumption in which certain types of foods, such as meat and some dairy products, which are relatively expensive but nevertheless also heavily consumed in certain European countries and North America appear to be consumed in fairly small amounts in Japan. On the other hand, the consumption of fish is very high in Japan. The more detailed information on which these remarks are based will be published in the main OECD report.

VII. SPECIFIC PPPs AND PATTERNS OF RELATIVE PRICES

The specific, or detailed, PPPs corresponding to the real expenditures in Table 4 are given in Table 5. These PPPs are, in effect, averages of the ratios of national prices to the corresponding average international prices within that particular category of expenditure. The average international prices are themselves expressed in U.S. dollars by equating the total value of the U.S. GDP measured at average international prices with its value in actual U.S. dollars. However, the average international price for an individual good or service, although expressed in dollars, is not the same as the actual U.S. price for that good or service, so that there is a specific PPP for the United States as well as for all the other countries for each detailed category of expenditure. These specific PPPs for individual categories of expenditure in the United States are all distributed about unity, of course, as can be seen from the first column of Table 5, because the normalisation procedure chosen to fix the absolute level of the international prices entails that, on average, their level is indeed equal to that of actual U.S. prices within the United States in 1980.

It follows that the specific PPPs for the United States show how actual U.S. prices compare, on average, with the average international prices prevailing throughout the entire group of countries considered. It can be seen, for example, that the prices of transport and communication services within the United States are relatively cheap compared with the pattern of average prices in the group as a whole - in effect, compared with average prices within the OECD area as a whole as most Member countries are covered. Conversely, the prices of medical services are relatively high in the United States compared with the rest of the OECD. Machinery and equipment prices are relatively low, while collective consumption prices are relatively high. And so on.

From an analytical viewpoint, it is convenient to normalise all the PPPs and not simply those for the United States. This is done in Table 6 in which all the specific PPPs for a given country are divided by GDP PPP for that country. In other words, all the specific PPPs in a given column of Table 5 are divided by the corresponding GDP PPP in the bottom row of the table.

In general, the relative price indices in Table 6 can be interpreted as showing how closely the pattern of relative prices within an individual country compares with the pattern of average international prices within the OECD area as a whole. The smaller the dispersion of the relative price indices for a given country in Table 6, the closer its pattern of relative prices conforms to the OECD average. If all the figures in one column were 100 the relative prices within that country would be identical with those prevailing, on average, within the OECD area.

The countries whose relative prices match those of the OECD as a whole most closely are clearly certain European countries. The correspondence is quite close for some countries such as France, Germany, Spain and Austria. On the other hand, the correspondence is not close for all European countries because there is also a distinct tendency for the pattern of relative prices in European countries to diverge further and further from the OECD average as

the level of real per capita GDP falls. Thus, the pattern of relative prices within Italy and the United Kingdom is noticeably less similar to the OECD average than that for countries such as France, Germany and Denmark, while the pattern of relative prices for the countries with lowest per capita GDP namely, Greece and Portugal, differs markedly from the OECD average.

Outside of Europe, relative prices in Japan, the United States and Canada all differ substantially from the OECD average. Indeed, relative prices in Japan seem to differ the most of all, on balance, and by at least as much as those in Greece and Portugal.

Not surprisingly the pattern of relative prices in Canada is very similar to that in the United States, but the similarity seems to be no greater than that observed between some of the member countries of the European Community. If the United States is compared with Japan the differences in relative prices are sometimes very marked e.g. in the case of medical care, recreation and education, food, beverages and tobacco, and collective consumption, but the differences are not very systematic: that is, the patterns of relative prices in the two countries are not noticeably negatively correlated. On the other hand, a negative correlation can be observed between relative prices in the United States and Portugal (especially if construction is ignored) and these two countries are, of course, the ones with the highest and lowest per capita GDPs within the group of countries covered.

The individual categories of expenditure shown in Tables 4 to 6 are not very detailed, but it may already by concluded from the summary data in Table 6 that patterns of relative prices are capable of varying considerably from country to country. Further disaggregation of the data would reveal even more variation. Thus, if it is desired to compare specific kinds of expenditures in real terms it is essential to calculate the corresponding specific PPPs. These are obviously capable of deviating from exchange rates much more than the global GDP PPPs do, so that there are very great risks involved in making comparisons of specific types of expenditures by means of exchange rates if the resulting figures are intended to reflect real differences and not merely large but unknown price differences.

A programme to calculate purchasing power parities automatically provides the kind of detailed information on comparative price structures which makes it possible to calculate special PPPs as required. The underlying price information can be reprocessed in different ways if necessary, while the price collection can also be reinforced in certain areas if particular needs are known in advance. Thus, special needs can be accommodated, especially if they are anticipated at the time the price surveys are planned.

It is sometimes suggested that the purpose of calculating PPPs is to arrive at a single number, an overall PPP at the GDP level, which can be used as a substitute for the exchange rate. In fact, of course, the GDP PPP is only one PPP out of many. Each aggregate, or category of expenditure, has its own PPP, and the ensuing PPPs are capable of considerable variation as shown in Tables 5 and 6. In practice, the calculation of purchasing power parities, in conjunction with the corresponding expenditure data, provides a mine of information about the economic structures of different countries which may be much more valuable to most analysts than some global parity for the economy as a whole, however useful that may be.

Table 5

PURCHASING POWER PARITIES (national currency units per US dollar) (a)

	United States	Canada	Japan	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Luxem-bourg	Nether-lands	Norway	Portugal	Spain	United Kingdom
INDIVIDUAL CONSUMPTION.....	0.978	1.06	255	16.4	39.2	8.48	5.15	5.76	2.60	38.7	0.514	815	35.8	2.58	6.90	36.3	68.8	0.528
FOOD, BEVERAGES, AND TOBACCO..	0.975	1.04	364	17.4	37.2	8.93	5.95	5.46	2.60	40.0	0.546	848	36.7	2.33	7.32	.3	67.1	0.550
CLOTHING AND FOOTWEAR.....	0.871	0.86	237	17.9	42.8	9.47	4.75	6.33	2.49	45.2	0.536	957	48.0	2.54	8.22	37.0	68.7	0.469
GROSS RENTS, FUEL, AND POWER..	1.038	1.01	296	14.7	44.1	8.48	4.62	6.04	2.91	50.6	0.391	621	41.2	2.78	5.22	29.6	72.4	0.518
HOUSEHOLD EQUIP. AND OPERATION	0.821	1.04	211	16.8	36.4	6.97	4.71	5.99	2.35	43.6	0.574	950	38.4	2.41	7.78	40.9	67.8	0.552
MEDICAL CARE.....	1.414	1.53	140	15.3	39.9	9.20	3.95	5.76	2.70	31.8	0.571	797	37.9	2.79	5.99	24.8	72.9	0.431
TRANSPORT AND COMMUNICATION...	0.732	0.88	194	17.1	37.4	8.26	5.68	5.59	2.41	31.7	0.655	838	29.8	2.74	7.96	41.1	67.9	0.615
RECREATION AND EDUCATION.....	1.067	1.20	369	18.9	40.5	8.22	7.17	6.07	2.54	26.0	0.309	977	35.5	2.60	8.51	35.1	69.2	0.482
MISCELLANEOUS GOODS & SERVICES	1.145	1.13	234	14.9	38.3	8.14	4.67	5.59	2.60	38.0	0.569	800	30.2	2.71	6.60	34.1	69.4	0.549
COLLECTIVE CONSUMPTION OF GOVT..	1.243	1.51	223	17.8	45.7	7.39	5.41	6.07	2.79	41.4	0.478	809	47.2	3.29	6.34	21.8	79.4	0.450
GROSS FIXED CAPITAL FORMATION...	0.911	1.00	245	16.4	37.4	7.55	4.70	5.27	2.43	41.1	0.550	859	36.9	2.83	6.87	51.5	65.7	0.639
CONSTRUCTION.....	1.086	1.19	310	15.9	38.4	7.63	4.29	5.16	2.53	36.5	0.501	788	38.4	3.06	6.78	53.2	65.7	0.727
MACHINERY AND EQUIPMENT.....	0.761	0.78	173	17.3	35.3	7.41	5.57	5.44	2.28	54.4	0.613	995	34.3	2.51	7.02	49.1	65.7	0.577
GROSS DOMESTIC PRODUCT.....	1.000	1.10	248	16.5	39.7	8.06	5.08	5.69	2.57	38.4	0.500	824	37.5	2.74	6.79	34.4	69.1	0.528

a) The figures in the first column of the table show the ratio of actual US prices to the corresponding average international prices expressed in US dollars. The two are identical, on average, only at the level of GDP because the value of the total US GDP expressed in average international prices is normalized to equal its value in actual $ dollars in 1980. In general, the purchasing power parity for any individual type of expenditure between a specified pair of countries (including the United States) is btained by dividing the figure shown in the table for the first country by the figure for the second country.

Table 6

RELATIVE PRICE INDICES(a) IN 1980

	United States	Canada	Japan	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Luxem-bourg	Nether-lands	Norway	Portugal	Spain	United Kingdom
INDIVIDUAL CONSUMPTION.....	98	96	103	99	99	105	101	101	101	101	103	99	95	94	102	106	100	100
FOOD, BEVERAGES, AND TOBACCO..	97	94	147	106	94	111	117	96	101	104	109	103	98	85	108	119	97	104
CLOTHING AND FOOTWEAR.....	87	78	96	109	108	117	94	111	97	118	106	104	128	93	121	108	99	89
GROSS RENTS, FUEL, AND POWER..	104	92	119	89	111	105	91	106	113	132	78	75	110	101	77	86	105	98
HOUSEHOLD EQUIP. AND OPERATION	82	95	85	102	92	86	93	105	91	113	115	115	102	88	115	119	98	105
MEDICAL CARE.....	141	139	56	93	101	114	78	101	105	83	114	97	101	102	88	72	105	82
TRANSPORT AND COMMUNICATION...	73	80	78	104	94	102	112	98	94	83	131	102	79	100	117	120	98	116
RECREATION AND EDUCATION.....	107	109	149	114	102	102	141	107	99	68	62	119	95	95	125	102	100	91
MISCELLANEOUS GOODS & SERVICES	115	103	94	90	96	101	92	98	101	99	114	97	80	99	97	99	100	104
COLLECTIVE CONSUMPTION OF GOVT..	124	137	90	108	115	92	107	107	108	108	96	98	126	120	93	63	115	85
GROSS FIXED CAPITAL FORMATION...	91	91	99	100	94	94	93	93	94	107	110	104	98	103	101	150	95	121
CONSTRUCTION.....	109	108	125	96	97	95	85	91	98	95	100	96	102	111	100	155	95	138
MACHINERY AND EQUIPMENT.....	76	71	70	105	89	92	110	96	89	142	123	121	91	92	103	143	95	109
GROSS DOMESTIC PRODUCT.....	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

(a) These indices are obtained by dividing the individual PPP's shown in each column of Table 5 by the GDP PPP in that column.

NOTES AND REFERENCES

1. See Kravis, Heston and Summers (1982) Hill (1982) and Eurostat (1983) for a detailed explanation of the meaning and significance of the concepts of "additive consistency" and "transitivity".

2. The precise method used is that which has come to be called the "Geary-Khamis" method in the specialist literature on the subject. It is explained in the following sources: Kravis, Heston and Summers (1982) Hill (1982) and Eurostat (1983).

3. See Kravis, Heston and Summers (1982) and Eurostat (1983).

EUROSTAT, Comparison in Real Values of the Aggregates of ESA, 1980 Statistical Office of the European Communities, Luxembourg, 1983.

T.P. Hill, Multilateral Measurements of Purchasing Power and Real GDP, Statistical Office of the European Communities, Luxembourg, 1982.

Irving B. Kravis, Alan Heston Robert Summers, World Product and Income, International Comparisons of Real Gross Product, published for the World Bank by Johns Hopkins University Press, Baltimore and London, 1982.