EMPIRICAL PROBLEMS IN INTERNATIONAL
COMPARISONS OF NATIONAL PRODUCT

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I. INTRODUCTION

OUR purpose in this paper is to review some of the statistical
and conceptual problems met with in an extensive empirical
study of comparative real national products. This study has
been undertaken at the O.E.E.C. and a report on its initial
results, which are concerned with the comparisons of the United
States, the United Kingdom, France, Germany and Italy, has
now been issued.[1]

Like other international organizations, the O.E.E.C. has had
to make use of international comparisons in its practical work.
Like them also, it has had to use estimates derived by the
exchange rate conversion to a common currency of national
currency data, or some simple variation of that method. The
reasons for being sceptical of such results have been forcefully
expressed in previous meetings of this Association and need not
be elaborated here. We may add, however, that the doubts of
national income experts are fully shared by national repre-
sentatives dealing with international economic and political
problems with the consequence that, when important issues are
at stake, such crude estimates are not accepted.

The development of national product estimates and the im-
provement in the details of those estimates offers the possibility
of more firmly based international comparisons. Furthermore,
the considerable volume of work done in recent years has helped
to clarify both the conceptual and statistical aspects of the
problem. The new edition of Professor Clark's *The Conditions
of Economic Progress* and the national income comparisons
prepared by the United States Statistical Office[2] have been quite
useful in practical work, though it cannot be said that they have
met the needs for detailed estimates. We would like to mention
particularly the stimulating paper by Professor Kuznets on

[1] *An International Comparison of National Products and the Purchasing Power
of Currencies*, Milton Gilbert and Irving B. Kravis, O.E.E.C.
[2] *National and Per Capita Incomes of Seventy Countries in 1949 Expressed in
United States Dollars*, United Nations Statistical Papers, Series E, No. 1, New
York, 1950.

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'National Income and Industrial Structure'[1] for its convincing demonstration of the limitations of a simple approach to the problem, and the study of the Combined Production and Resources Board on the *Impact of the War on Civilian Consumption*[2] for the indication it gave to a detailed statistical approach. The interesting papers of Professor Rao[3] and Mr. Barna[4] to this Association have also served to clarify conceptual aspects of international comparisons.

Despite this background, our frame of mind in approaching the O.E.E.C. study was frankly experimental. While we had no doubt that a detailed comparative study would yield interesting results and make a contribution on which further research could be built, we knew it was not feasible at present to produce definitive estimates for all components of the national product. We wished, however, to see to what extent adequate data could be obtained for this task, to indicate the kinds of additional data that would be required for improved estimates, and to try to resolve, in our own minds at least, some of the conceptual and methodological issues involved. It will be evident enough from a review of the sources and methods used that the results thus far cannot be considered definitive, but we do feel that it has proved feasible to base the estimates on a sufficient volume of data for the comparisons to command an acceptable degree of confidence. This is, of course, on the proviso that the conceptual point of view used in the study is considered appropriate for the purpose.

The amassing of adequate statistical information for the study has been possible only with the help and co-operation of the statistical agencies in the various countries. They have not only given us access to unpublished material but also participated in the field work and in the preparation of the special estimates required. We had the advantage also of adequate staff for the

[1] *Proceedings of the International Statistical Conferences, Sept. 6–18, 1947, Vol. V*, Washington D.C., also published in Simon Kuznets', *Economic Change*, New York, 1953.

[2] U.S. Government Printing Office, Washington, 1945, and H.M.S.O., London, 1945. See also the discussion of this study by Copeland, Jacobson and Clyman, 'Problems of International Comparisons of Income and Product', *Studies in Income and Wealth, Vol. X*, New York, 1947.

[3] V. K. R. V. Rao, 'Some Reflections on the Comparability of Real National Income of Industrialised and Under-developed Countries', *Income and Wealth, Series III*, Cambridge, 1953.

[4] T. Barna 'The Use of National Accounts of European Countries in Economic Analysis', *Income and Wealth, Series III*, Cambridge, 1953.

collection and processing of data as well as the means of sending the staff to the various countries for field work.

In the study as a whole, we are utilizing two methods of approach: the one is based on data related to end-product components of the gross national product, while the other uses information on value-added by industries. We are hoping to cover the same group of countries by both methods, both in order to explore the problems involved in each method and to be able to check the results of both methods against each other. At the present time, however, we have completed comparisons only by the final expenditure approach and will confine ourselves to that method in this paper.

In brief, the following steps are involved in comparing the national products of two countries by this method:

(1) obtaining comparable value estimates for as detailed a breakdown of the gross national product by final expenditure categories as is feasible;

(2) securing quantity indicators for each category of expenditure in appropriate quantity units;

(3) securing unit value weights for each component;

(4) combining the quantity and price data in accordance with the usual index number procedure, using alternatively the relative unit values of each country.

This procedure yields two index relationships for the real product comparison between the two countries.

Leaving aside the broader conceptual issues, which are linked with the purpose of the comparison, we found that there were three main statistical hurdles to be overcome in order to assure reasonably accurate results:

(1) obtaining comparable and accurate estimates of the gross national expenditure, not only in the aggregate but by detailed expenditure categories;

(2) obtaining suitable and accurate quantity indicators for each expenditure component;

(3) making appropriate adjustments for the quality differences in end-products that may exist between the countries.

We may now indicate the methods used to deal with each of these main problems.

For all the detailed expenditure classes being used to compute the index comparisons, it was necessary to have data on total value, quantity, and unit value. From any two of these, of course, the third could be derived. But in order to have a check on the data and to be in a position to use judgment in selecting the combination that seemed most accurate, we insisted on getting all three wherever possible. The expenditure estimates proved to be more troublesome than we anticipated, more because of statistical than because of conceptual difficulties and, as just indicated, were not finally determined until compared with the quantity and price data. Adjustments of and additions to the available gross national expenditure estimates of the following kinds were found to be necessary.

(a) *Conceptual comparability.* The available estimates of a gross national expenditure had to be adjusted in various ways in order to make them conform to the uniform concept being used in the study, which was that of *A Standardized System of Accounts* This task was greatly facilitated by the previous work done at the O.E.E.C. to adjust the estimates of member countries to the Standardized System, though the detailed review necessitated by the study revealed the need for further adjustments.

(b) *Uniform classification.* It was necessary also to adjust the available estimates in various ways to impose a uniform classification on the composition of expenditures. The classification used differs somewhat from the Standardized System both in order to make it easier and to apply appropriate quantity indicators to certain sub-groups and to make the comparison of certain types of expenditure more meaningful. The main differences are that expenditures on personnel services are generally taken as separate sub-groups, and government expenditures on health and education are combined with private expenditures under the major category of Consumption rather than being left under Government.

(c) *Adequate detail by product classes.* Both in order to make the uniform classification possible and to provide sufficient detail in the breakdown of expenditure for the purpose of the real product comparisons, it was necessary to prepare additional estimates of product classes. While in part this only meant utilizing unpublished material with the help of the national

statistical offices, in part it involved straining available source material to produce detailed estimates for which they were not really adequate.

(*d*) *Statistical comparability*. Some changes were required in the available estimates in order to improve their statistical comparability from country to country. In a few instances, the need for this type of adjustment was due to the fact that statistical assumptions, required in the original estimates because of the absence of firm source data, differed more from country to country than appeared reasonable. Also since the original estimates were in part produced by different methods and from different types of sources, there were cases in which the lack of comparability was rather apparent. As is well known, alternative estimates for particular components of the national product derived from different basic sources can differ rather significantly in one country and experience with this sort of thing was helpful in improving the statistical comparability of the estimates.

Thus, we made a rather thorough effort to adapt the existing gross national expenditure estimates to the needs of the study by making the conceptual and statistical changes that appeared to be necessary. While an international staff is in a rather favourable position to exercise judgment in this matter, the fact that one does not start out with really comparable estimates is an obvious handicap to accuracy. We believe the statistical differences are more important at the present time than the possible uncovered conceptual differences and that the detailed checking of sources and methods among countries would contribute materially to improving international comparisons in the future.

III. QUANTITY INDICATORS

From a procedural standpoint, three types of quantity indicators have been used in computing the quantity comparisons.

(*a*) For expenditure classes consisting of a fairly homogeneous product, the product comparisons were based upon quantity statistics. We tried to use quantity data as much as possible in order to reduce the dependences of the comparisons on value statistics which we believe are apt to be less reliable at the present stage in the development of national product estimates.

It should be noted, however, that quantity data are available and applicable in some cases for precisely the product groups where relatively good value and price data are also available, while for some of the groups where the value data are weak, quantity data are also non-available.

In any case, for the homogeneous products that can be measured in quantity terms, the only problem that arises is that of the appropriate units of quantity. We do not believe such problems are difficult in the sense that they could constitute a large source of error and, while we may not have always chosen the most appropriate units, we believe that some discussions of the matter among experts should lead to acceptable solutions. As would be expected from the experience with quantity indexes over time, the difficult cases are those involved in certain types of services such as medical and telephone services.

(b) Once these homogeneous products are eliminated from their product classes, there often remains some relatively small portion of expenditures in the product class unaccounted for. Such is the case with cereal products after bread and pastes are accounted for or with tobacco products after cigarettes and smoking tobacco are eliminated. The quantity indicators for these residuals were obtained by adding the expenditures to those of the major product or products in the group and adjusting the quantity upward in proportion to the increase in expenditures. In effect, the price ratio for the major product is used for the product class as a whole, and if this had not been considered representative it would have been necessary to subdivide the product class. It will be noted that this procedure differs from the usual one in production indexes. There the quantity indicator for the major product or products of a group are taken as representative of the quantity change for the group and are given the group weight. In the procedure we used, however, the price ratios of the major products are taken as representative of the group but quantity indexes between major and minor products may differ from each other.

(c) For expenditure classes composed of a diversified group of products such as clothing, household goods, and producers' durable equipment, the quantity indicators between the countries were derived by dividing the expenditure ratio for the product class by a price ratio obtained from a weighted sample of unit prices representative of goods in the class. The problems

involved in this method are those of obtaining an adequate sample of prices to be representative of the assorted products in the expenditure class and of assuring that the various prices used relate to identical goods – that is that there are no quality differences from country to country. Fairly extensive field work was necessary to secure data adequate to overcome these difficulties. In so far as possible, we utilized the price data available in the Statistical Offices, relying on the field investigation to adjust their prices for differences in the quality specifications used by the various countries. For other groups, however, notably producers' durables, the available price material was inadequate and prices had to be secured from producers and trade associations.

Generally speaking, we were less satisfied with this method of obtaining quantity indicators than with the method of direct quantity statistics. The reason for this was, however, the weaknesses of certain of the expenditure estimates rather than the difficulty of obtaining comparable prices for those product groups. In the cases for which we were not able to obtain sufficient price information, we believe the difficulties were those of staff and time rather than the inherent complexity of the problems.

The extent to which this method must be used depends upon the amount of quantity data available and the sub-division of the gross national expenditure that is feasible. We believe that some improvement along these lines will come about rather easily as national expenditure data themselves are improved. For example, we had expected that it would be possible to subdivide producers' durable equipment and to obtain quantity data for some of the important categories of such investment from production statistics. We found, however, that this could not be done to an extent to make a significant difference in the reliability of the results.

IV. ADJUSTMENTS FOR QUALITY DIFFERENCES

There is no doubt that the problem of quality differences presents difficulties which require careful and detailed work to overcome, but we believe there has been some tendency to overemphasize them in some past discussion. The incident that Dr. Geary has related of a previous study of comparative cost-

of-living may be recalled. A basket of United States goods was being shipped from country to country to be priced in the various markets and an Irish merchant was shown a man's suit and asked what it would sell for in Dublin. He replied that no self-respecting Irishman would be seen dead in such a suit. One can thoroughly enjoy this story without succumbing to the illusion that it has much to do with the quantitative problem of international comparisons.

If a complete list of all the products available in the two economies being compared was at hand, it would be possible to divide them into three groups: identical products, common products and unique products. The first group would be those which were sufficiently alike in their specifications to be considered equivalent for comparative purposes and, hence, the ratios of the quantity units available in the two economies would constitute the appropriate quantity comparisons. Superficial differences in specifications to meet local taste or industrial practices can be ignored, as can style and design differences which would not involve substitution costs. In practice also, it is necessary to treat products as identical when there is no apparent characteristic by which to measure quality, as is the case with certain services. More important, perhaps, is the fact that information on grades is not available for some products, particularly foods, where it is nonetheless desirable to use quantity information. There is thus no alternative to treating them as identical.

The common products would be those for which the specifications differed sufficiently for the units not to be considered as equivalent and, hence, an adjustment for the difference in quality would be needed to arrive at true quantity comparisons. Unique products are those which appear in only one or the other of the two economies and, hence, which must be included in the overall comparison by assigning their expenditures to other products or by estimating cost ratios for them. For both theoretical and practical reasons, it is necessary to treat certain products as unique even though a small amount of the product might be used in the second country. This is the case when, because of their limited distribution, the relative prices of the products are not representative of cost conditions for comparable goods. For example, in the comparison between the United States and France we treated fuel oil as a unique product,

even though there was a small consumption in France at the time, while in the case of Italy beer was treated as a unique product, although there was some consumption. This is similar to changing the base year unit value weight in production indexes over time of products that have undergone rapid expansion and hence a drastic change in unit price. We might add, however, that for the countries involved in the study the quantitative significance of unique products was negligible.

Thus, the practical problem of obtaining truly homogeneous product classes is that of adjusting for the quality differences among common products. We used two methods in dealing with this problem. The first of these has already been mentioned in discussing the method of obtaining quantity indicators from value and price data. This consists in securing a sample of prices for identical qualities of the goods priced, so that the resulting price ratio is already representative of identical goods. The method thus assumes that the qualities not priced would have the same price ratio as the identical qualities. The problem of accuracy in this method is, of course, one of the adequacy of the sample but there is little reason to believe that the existence of a range of qualities adds to the difficulties already inherent in there being a wide range of products in such product classes. Our pricing expert, who had considerable experience with the pricing of consumption goods according to specifications, did not find it too difficult either to find identical qualities or to estimate cost differences with the help of trade experts. For producers' durables also where we relied more on the judgment of the trade, we did not find much hesitancy on the part of producers once they understood the nature of the estimated cost difference that had to be made. The failure we had with a product group such as furniture was due really to insufficient preparation and lack of time or, to say the same thing another way, to inadequate knowledge of furniture products.

The other method was that applied to the products being measured in terms of quantity units. It consists of adjusting the quantity units for the price differential existing in the two markets between the average qualities prevalent in the two markets. If the price differentials do not exist in practice, it is necessary to estimate the difference in cost that would be involved in shifting to the alternative quality. The additional practical problem involved is to find the appropriate criteria of

quality difference to which costs can be related to produce an index of quality. In the case of cigarettes, for example, quality adjustments were made for the difference in the quality of the tobacco used on the basis of the cost of the alternative qualities. We may note also that the unit of quantity was weight rather than number. For housing services, the average quality of dwelling units in each country was defined by means of the available data on measurable physical characteristics such as floor space, room-count, presence or absence of running water, bath tubs, flush toilets, and age of dwelling units. The quality difference was then measured by the difference in rental value in both markets of the average qualities prevailing in each of the countries. Some approximation was necessary, of course, to relate average specifications of the second country to the data on the rental scale in the given country, though we believe the available data did not leave a very wide margin of choice. The essential problem with regard to motor vehicles was to adjust for a substantially smaller average size of car in European countries. A fairly good relationship was found between the weight of cars and their prices, after ignoring the upper extremes of a few luxury cars sold in a very small amount and after allowing for the fact that the only really small car in the United States (Crosley) was not produced in a large enough volume to be representative of United States car prices. This relationship was taken as the quality index to adjust the number of automobiles to comparable units.

When such methods do not appear to offer an acceptable solution to the quality problem, the only alternative is to subdivide the product class. We did this in the case of educational personnel, for example, dividing all teachers into primary, secondary and higher education and then treating each group as identical services. We would have liked to do the same thing for Armed Forces personnel, but did not have information on the composition of the Armed Forces for the various countries.

In judging whether an acceptable basis of comparison can be established between products of different qualities, it is important to recognize that there are theoretical limits to the kind of quality differences that are measurable. This is the case whether adjustment is being made by means of establishing a purchasing power equivalent for identical goods or by an index of quality. We have tried to clarify this matter by distinguishing

between economic and non-economic quality differences. The essential point is that account can be taken only of such differences in the quality of any product that require differences in costs to produce. If the change from one quality to the other would involve no cost of substitution to producers, the quality difference must be considered non-economic in the sense of being outside quantitative measurement. This applies to many differences (or alleged differences) in quality that arise from differences in the state of knowledge or of the art of production.

It will be noted that in outlining the main statistical problems in international comparisons, we have not mentioned prices as such. We believe that the real difficulties with respect to prices are in their use as a means of arriving at quantity indicators. The need for prices as weights, however, does not present a difficult problem and we do not feel that any shortcomings there may be in the price weights, assuming that reasonable care has been taken to obtain the average unit values, will have a significant influence on either the major group of the overall results.

V. VALUATION OF RESULTS

Having in view the limitations imposed on the comparisons by the statistical problems discussed above and the degree to which they could be resolved for the various product classes, we may try to summarize our experience by an evaluation of the results attained. In the following table, we indicate first, whether the product classes were treated as identical or common products. It will be recognized that for those indicated as identical, small portions of the expenditure may have been treated as common or as unique products. We have further shown whether the quantity comparison for the product class was based on quantity data or a combination of expenditure and price data. Here, too, small fractions of the expenditure may have been treated differently than the bulk of the product class. Finally, we have indicated our valuation of the results in terms of three grades. There is nothing more to these grades, of course, than subjective judgment based on the experience we have had in working with the data. It would be quite subjective also to express these grades in words, but we might say we had in mind something like very good, good, and weak, for the grades 1, 2, and 3, respectively. The grades themselves are not

conceived as rigid indications of probable accuracy, but reflect the fact that the ultimate possibilities are quite different for the different product classes; for example, both clothing and miscellaneous consumption are marked 2 though there is no doubt that the clothing estimates are better. Furthermore, the grades as a whole tend to be conditioned by the feeling one has about the stage that has been reached in national accounts research; after many years of intensive research had been devoted to the subject, some of the same markings might be applied to much more firmly based estimates. The grades by product classes are intended to cover the estimates for all of the five countries and not just the pair with the best information in each case.

The share of the various product classes in the United States gross national product are given in Table I to provide an indication of the relative importance of some of the factors discussed above. The product classes treated essentially as identical goods constitute 37 per cent of the total, and those for which the real quantity comparisons were based on quantity data make up approximately half the total. These percentages would be substantially higher in terms of the national products of the European countries, as food and services form a larger portion of total output in Europe. As for the grades assigned to the estimates, the data underlying the comparisons are considered weak for 12 per cent of the total product, while the rest is fairly equally divided between grades 1 and 2.

In order to give more substance to the judgments involved in arriving at some of the lower grades as well as to indicate what would be necessary to improve the comparisons, the factors taken into account may be mentioned. The comparisons for the following product classes are considered weak:

Furniture. The expenditure estimates are rather weak and the sample of prices very thin, even recognizing the inherent difficulty of this product class.

Household and personal supplies. The sample of prices is inadequate and the expenditure estimates do not have a sufficiently firm basis in all cases.

Other recreation. Apart from radio broadcasting, neither quantity indicators nor prices were available for this product class.

Medical supplies and hospital services. We could not find a

TABLE I

Evaluation of International Quantity Comparisons by Product Groups

Product Class	Per cent of U.S. Product 1950	Comparability of products		Type of Quantity Indicator		Valuation of Results		
		Identical	Common	Quantity data	Expenditure and price data	1	2	3
Consumption	69.6							
Food	17.9	x		x		x		
Alcoholic beverages	1.2	x		x		x		
Tobacco	0.8		x	x		x		
Clothing and footwear	7.8		x		x		x	
Housing services	5.6		x	x			x	
Fuel, light and water	2.4	x		x		x		
Furniture	2.8		x		x			x
Household equipment and appliances	2.7		x		x		x	
Household and personal supplies	1.5		x		x			x
Domestic services	0.9	x		x		x		
Dry cleaning, laundry, etc..	1.3		x		x		x	
Barber, beauty shops	0.4		x		x		x	
Transportation equipment	3.5		x	x		x		
Operation of transportation equipment (except gas and oil)	1.3		x		x		x	
Gasoline	1.6	x		x		x		
Public transportation	1.2	x		x		x		
Communications	0.9		x		x	x		
Cinemas	0.6	x		x		x		
Other amusements	0.3	x		x			x	
Hotels and restaurants	2.3		x	x		x		
Reading materials	0.9	x		x		x		
Other recreation	0.8		x		x			x
Medical personnel	2.4	x		x		x		
Medical supplies and hospital services	1.6		x		x			x
Education:								
Personnel	2.2	x		x		x		
Other	0.2		x		x		x	
Miscellaneous	4.5		x		x		x	
Investment:	21.7							
Producers' durable equipment	8.2		x		x		x	
Construction	10.8		x		x		x	
Inventories	2.2		x		x			x
Net exports	0.5		x		x	x		
Government – Civil:	3.5							
Personnel	2.3	x		x		x		
Purchased goods and services	1.2		x		x			x
Government – Defence:	5.7							
Personnel	3.0	x		x		x		
Purchased goods and services	2.2		x		x			x
Per cent of total	100.0	37	63	49	51	42	46	12

satisfactory method of comparing hospital services in terms of services rendered and so we based the quantity indicators on the inputs of goods and services used by hospitals. It was obvious from the relative costs per hospital-bed or per patient-day that these units of quantity did not represent comparable units of service rendered. But even if comparisons of inputs are considered conceptually correct, the data on the breakdown of hospital costs and costs per unit of input needed to compute them are largely not available. In addition, adequate prices for drugs and medical supplies were not available and we did not have the resources to obtain them.

Inventories. The value estimates of stock changes are very weak in some cases. In order to make reasonably adequate comparisons, moreover, we feel there should be available some breakdown of inventory change by industry or by commodity.

Government-purchased goods and services. For most countries there is no information on the composition of civil government purchases (apart from personnel costs). For the defence component, we had reasonably good data on the composition of the purchased goods and services but no direct information for computing price ratios. As civilian price ratios may well be applicable to a substantial portion of these purchases, we may be unduly strict in giving grade 3 to the product class as a whole.

The following may be noted for the important product classes assigned to grade 2:

Clothing and footwear. The expenditure estimates in some cases need improvement. While the price samples we obtained are reasonably good for a first attempt, they are not adequate to warrant a higher grade.

Housing services. The data on rural housing are inadequate. For urban housing, the information needed to make the adjustments for differences in quality should be more uniform. In order to command greater confidence, the comparisons should perhaps be based on data which would allow a breakdown of dwelling units into a series of grades with more precise specifications for each grade.

Household equipment and appliances. While data on major appliances are rather good, the smaller items of household equipment are inadequately represented.

Miscellaneous. The expenditure estimates are rather weak in some cases.

Producers' durable equipment. Expenditure estimates are rather weak in some cases and, in addition, we feel that adequate comparisons for this important group should be based to some extent on quantity data.

Construction. While we were able to obtain some data on prices of final items of construction, we had to rely to a considerable extent upon the comparative costs of performing a variety of construction operations, including, of course, the costs of the materials used in the operations. Perhaps more direct comparisons of some completed structures could be used to give the estimates a firmer foundation, but, in any case, the estimates of costs need to be improved.

VI. CONTRAST WITH EXCHANGE RATE CONVERSIONS

As this study was intended to explore the possibilities of deriving more acceptable international comparisons of national products than are obtained by exchange rate conversions, we would like to draw attention to a few of the important differences in the results of the two methods. These are not only differences in the magnitude of the indexes for the overall comparisons but in the complexity and character of the results obtained.

It may be noted first from Table II that the comparisons based on exchange rates differ very substantially from the real comparisons. This is the case not only of the product level of the European countries relative to the United States but also for the comparisons among the European countries. For the European countries covered by the study, the conversion of their national products (*per capita*) by exchange rates severely understates the level of real product compared to that of the United States. This is so for the real comparisons based on either United States or European price weights; i.e. the exchange rate conversions do not fall within the range of Paasche and Laspeyres indexes in any case. Professor Kuznets has indicated some of the reasons why the use of purchasing power ratios for internationally traded goods should underestimate the real income level of lower income countries and our results coincide with his conclusions.

It has been recognized that the exchange rate method would be biased when there is a significant disequilibrium in the rate of exchange between two countries being compared. In order to correct for such disturbances, the rate of exchange is often

TABLE II

Per Capita *Gross National Product Relative to United States, 1950*

(U.S.=100)

	Derived Exchange Rates	Real Comparisons		
		U.S. Price Weights	Average European Price Weights	Geometric Average
United Kingdom .	37	63	53	58
France . . .	35	53	42	48
Germany . .	26	43	33	38
Italy . . .	16	30	22	26

adjusted for the change in purchasing power parity from some base data which is believed to reflect the purchasing power relationship between the currencies more accurately. It does not appear, however, that such computed purchasing power parities consistently improve matters. For example, the following comparative income levels for the year 1949 were obtained by the U.N. Statistical Office by exchange rate conversions, except for the United Kingdom, where a computed purchasing power parity was used:

United States	100
United Kingdom	53
France	33
Germany	22
Italy	16

By contrast with the exchange rate estimates in Table II, the use of the purchasing power parity for the United Kingdom improves the relationship between the United States and the United Kingdom, but makes the relation between the United Kingdom and the other European countries worse. A similar adjustment for the change in purchasing power parity for France would change the French index figure to 29 and thus further distort the comparison with all other countries except Germany. It appears, therefore, that the differences between exchange rates and real purchasing power equivalents, as indicated in Table III, are too fundamental to be reconciled by any simple statistical manipulation.

TABLE III
Exchange Rates and Real Purchasing Power Equivalents, 1950
(Units of currency per U.S. dollar)

	Currency Unit	Exchange Rates	Purchasing Power Equivalents	
			U.S. Quantity Weights	European Quantity Weights
United Kingdom .	£	0.357	0.288	0.218
France . . .	franc	350	313	223
Germany . .	mark	4.20	3.63	2.52
Italy . . .	lira	625	577	328

This statistical conclusion is reinforced by an important conceptual consideration; namely, that a single index comparing the *per capita* product of two countries must oversimplify the problem of international comparisons because two indexes are possible, based on the relative price structure of the two countries. The practical significance of this point would be lessened, of course, if the difference between the indexes based on the alternative sets of weights proved to be small. Professor Clark's strong advocacy of the use of the geometric average of the two indexes would be convincing only if that were the case[1]. However, the index number spread for both the real product comparisons and the real purchasing power equivalents turns out to be very large and one can readily see that the differences must be significant for many uses of the comparisons. The real product indexes in Table II, computed by the two sets of price weights, differ by as much as 20 per cent for the United Kingdom to more than 35 per cent for Italy.

It is interesting to note that there is an evident tendency for the percentage index number spread to increase as the difference in the real product level between the countries being compared increases. This tendency is certainly not due to chance but has its basis in economic reality. This is the strong probability (perhaps one should say certainty) that the internal price structures of countries will be more dissimilar, the larger are the differences between them in real income level. It would seem that this must be so because the real income level itself is such an important determinant of prices for products consisting entirely

[1] Colin Clark, *Conditions of Economic Progress*, 1951 edition, London, pp. 16–18.

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or largely of personal services. And, of course, it is the dissimilarity of the price structure that produces the index number spread.

As two indexes can be computed for every pair of countries being compared, a formidable array of figures would result from the comparison of a group of countries if all the combinations were exhausted. In order to be able to compare the five countries we dealt with as a group in a manageable way, we used European average relative prices as one set of weights and United States prices as another. The technique of grouping countries to compute one set of price weights from them, required that relative price structures be sufficiently alike so that combining them does not materially affect the results. This was evidently the case if the European countries are contrasted with the United States, though for Italy the changes produced by the use of average European weights, in contrast to Italian weights, are not negligible. We have not yet tested the results enough to know to what extent the intra-European comparisons are oversimplified by this method. However that may turn out, we believe that appropriate groupings of countries will prove a useful technique in comparisons of larger groups of countries.

The fact that there are large differences between the indexes based on alternative sets of weights, for the indexes of both comparative product and purchasing power equivalents, is of importance in all problems involving comparisons of components of the national product. We found the range of quantity ratios and price ratios among the individual product classes to be very wide, which would necessarily be obscured in estimates based on overall purchasing power ratios such as exchange rates. The differences in the indexes for the major components of the national product are shown in Tables IV and V and, of course, such differences are much greater among the detailed product classes.

There are, of course, many influences which determine the quantity and price ratios of the individual product classes such as tastes, the degree of essentiality of various goods, relative productive efficiency, and availability of natural resources. It is very striking, however, that food and personal services have relatively low costs in the European countries whereas industrial goods and services requiring substantial capital investment have relatively high costs. Furthermore, these differences in price

TABLE IV

Comparative Per Capita Gross National Product by Major Components, 1950

(United States=100)

	U.S. Price Weights				European Price Weights			
	Total	Con-sump-tion	In-vest-ment	Gov-ern-ment	Total	Con-sump-tion	In-vest-ment	Gov-ern-ment
United Kingdom .	63	66	35	107	53	53	38	85
France . .	53	53	41	90	42	40	41	64
Germany . .	43	42	39	70	33	32	33	44
Italy . . .	30	31	119	52	22	22	18	33

TABLE V

Internal Purchasing Power Equivalents for Major Components of Gross National Expenditure, 1950

(Units of currency per U.S. dollar)

	Ex-change Rates	Prices Weighted by U.S. Quantities				Prices Weighted by European Quantities			
		Total	Con-sump-tion	In-vest-ment	Gov-ern-ment	Total	Con-sump-tion	In-vest-ment	Gov-ern-ment
United Kingdom (£)	0.357	0.288	0.299	0.281	0.215	0.218	0.225	0.257	0.154
France (franc)	350	313	315	322	260	223	219	276	181
Germany (mark)	4.20	3.63	3.84	3.42	2.38	2.52	2.62	2.58	1.92
Italy (lire)	625	577	586	592	462	328	334	461	174

structures have a strong influence on the relative patterns of product use, there being a negative relationship between the quantity and price ratios for the individual product classes that prevails not only for consumption goods but also for investment and government. Thus, the quantity ratios for food and services in the European countries are substantially higher than the ratios for the total national products, while the ratios for industrial goods are substantially lower than average. Among the industrial goods, there is a strong tendency for the quantity ratios to be lower for the goods requiring larger amounts of capital in the production process.