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PROBLEMS OF INTERNATIONAL COMPARISONS OF INCOME AND PRODUCT

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AN INTEGRAL PART of the United Nations is a Social and Economic Council, which has among its aims the development of policies directed toward raising standards of living in all countries, and the creation of awareness throughout the world of the economic problems of each country. This Council, aided by many factors, will undoubtedly stimulate international economic research. This means that international comparisons of national income and gross national product will be of much greater importance.

International income comparisons can be helpful in dealing with many matters. For example, they may show the role played by the export-import trades in a nation's total economic activity, they may make possible international comparisons of productivity and living standards, and they may reveal the allocation of economic resources between consumption and capital formation in various countries, the proportion of each nation's resources devoted to producing military goods and services, its capacity to make an international economic contribution, and the response of economic activity in one country to changes in others.

Mere totals of the national income of each country will not throw much light on questions such as these. More detailed analysis of the components of national income and of related factors is essential. Even when formal comparability in respect of definitions has been achieved, a comparison of percentage

figures, e.g., of the proportion of national income devoted to civilian consumption in two countries, may be misleading. And any attempt at absolute comparisons in value terms, using over-all exchange rates for conversion to a common currency unit, is hazardous. When an investigator seeks accurate conversion factors to enable him to state per capita incomes for two countries, e.g., in United States dollars, he encounters numerous difficulties. Illustrations of these propositions are offered below.

The report recently prepared for the Combined Production and Resources Board dealing with the impact of the war on the civilian economies of the United Kingdom, Canada, and the United States is evidence of the extensive cooperation among the economists and statisticians of the three countries who collaborated on it.¹ (Such collaboration is possible only under the auspices of an international body such as the CPRB.)

The report presents physical volume measures comparing prewar and wartime consumption in each country. For various areas of consumption an attempt was made to provide also intercountry comparisons of absolute consumption levels. Further, in order to indicate how and why the war affected consumption levels and patterns, estimates of national income and gross national product and their components were examined. It may be instructive to review the experience encountered in developing these measures.

However, if this experience is to be taken to illustrate the problems involved in international income comparisons, it should be with the understanding that only the problems as they appear under relatively favorable conditions are illustrated. The CPRB report necessarily took as its basis existing

¹ *The Impact of the War on Civilian Consumption in the United Kingdom, the United States and Canada* (Washington, D. C., Government Printing Office, 1945; London, His Majesty's Stationery Office, 1945). A Combined Committee on Nonfood Consumption Levels was established by the CPRB to be responsible for the preparation of this report. The members of the committee were: from the United Kingdom, Harry Campion and R. G. D. Allen; from Canada, J. F. Parkinson and R. W. James; from the United States, Emerson Ross and Morris A. Copeland, Chairman. The names of other collaborators appearing on the title page are: from the United Kingdom, W. B. Reddaway, E. F. Jackson, and Miss P. M. Nye; from Canada, Miss M. L. Reid; from the United States, Charles Merwin, Jerome Jacobson, and Bernard Clyman. In addition, the report acknowledges gratefully the contributions of many agencies in the three countries whose economists and statisticians participated in its preparation.

compilations. But the wealth of statistical data available for the three countries covered by the report contrasts with the poverty of data for many — indeed for most — other countries. Moreover, comparisons were greatly facilitated by the close cultural kinship of the three countries; or rather, the difficulties inherent in cultural differences were minimized.

The accomplishments and shortcomings of the report may be briefly summarized. Among the accomplishments are:

The national incomes (and gross national products) of the three countries, together with broad divisions by both source and use, were presented on an approximately comparable conceptual basis.

These compilations made possible various percentage comparisons, e.g., the percentage of gross national product devoted to war. To illuminate this particular percentage, roughly comparable allocations of employment between war and nonwar were made.

Various components of national income were corrected for price changes, particularly munitions production and several categories of consumption. For the consumption categories intertemporal comparisons were thus made possible, e.g., comparisons of the percentage changes from prewar to wartime levels in the three countries.

For various components of national income crude interspatial comparisons were developed. These made it possible to say, for example, that United Kingdom per capita consumption of tobacco before the war was about 80 percent as large as United States.

On the negative side the following points may be noted:

While a standard set of national income and gross product components was adopted, full detail for all three countries was impossible. For example, saved income estimates were not available for Canada and several consumption categories had to be bracketed to make them comparable with United States and United Kingdom figures. Only for the United States was a refined measure of the percentage of gross product devoted to war given.

Even had perfect conceptual comparability been attained, such ratio computations as that of war product to gross national product would still have involved serious incomparabilities, due

to differences in the price structures of two economies and to the fact that one country imports proportionately more food-stuffs than the other.

Some adjustments for price changes used in the intertemporal comparisons were far less satisfactory than others. In the case of the United States, most, if not all, are in an area of acrimonious controversy.

Interspatial comparisons are notoriously more difficult than intertemporal; accordingly, the results shown for such comparisons are thought to be considerably less dependable. All interspatial comparisons were rounded to the nearest 10 percent and relegated to the Appendix. The list is somewhat shorter than that for intertemporal comparisons.

No attempt was made to present time series for either total national income or gross national product, adjusted for price changes. The chief components not adjusted for price changes were in the area of savings and capital formation. Nor was any attempt made to present a direct interspatial comparison of levels of national income or gross national product. Interspatial comparisons were lacking for a somewhat larger area — including in addition to savings and capital formation most consumer services and a category of miscellaneous consumers' goods.

Canadian compilations, according to the standard pattern adopted, were less complete than those for the other two countries, largely because extensive revisions of Canadian income estimates are not yet finished. Partly for this reason and also to simplify the statements, attention is given chiefly to United Kingdom-United States comparisons in the more detailed consideration of the problems of international income comparisons that follows.

The discussion of intercountry income and product comparisons may conveniently be divided into three main parts: (a) conceptual comparability and comparability of component ratios; (b) comparability of measures of intertemporal change; (c) direct intercountry comparisons.

1 CONCEPTUAL COMPARABILITY AND COMPARABILITY OF COMPONENT RATIOS

It was hoped that if the totals of income and gross product and their chief components were brought into approximate agree-

ment conceptually, approximately comparable component ratios could be derived.

The starting point for total United States income in current prices was the estimates prepared by the United States Department of Commerce; for the United Kingdom income the basic estimates were those presented in the White Paper on war finance: *An Analysis of the Sources of War Finance and Estimates of the National Income and Expenditure in the Years 1938 to 1944*, Cmd. 6623. To approximate a uniform definition of national income and gross national product the following adjustments were made:

Wages and salaries

Employers' social security contributions were added to United Kingdom figures; the value of food and clothing furnished the armed forces and the government's share of dependency allotments were added to the United States figures.

Additions to corporate surplus

Corporate income and profits taxes were regarded as part of this distributive share and were added to the United States figures.

Income from ownership of property

This was defined to include imputed rent; therefore, net imputed income derived from owner-occupied residences and tenant-occupied farm residences was added to the United States figures.

Capital gains

The United Kingdom figures have the effect of counting the increase in the value of business inventories rather than the value of the increase in inventories. No satisfactory estimate of the value of the increase in inventories was available for the United Kingdom. Consequently, estimated capital gains and losses on inventories were added to the United States figures for additions to corporate surplus and entrepreneurial profits.

Interest and dividends

For a while it was hoped to include imputed interest figures, based on estimated tangible government assets, to replace cash interest payments by governments. As it was impossible to do

this in the time available, cash interest payments on the United Kingdom central government debt and the United States federal debt were omitted.

Personal remittances and institutional contributions

To approximate an income received basis, net personal remittances and institutional contributions paid abroad were deducted from interest received from abroad in the case of the United States.

Gross national product

Gross national product derived from the economy (by source of funds) was taken to be equal to national income received, less income received from abroad, plus 'depreciation, depletion, and capital outlays charged to current expense'.

Depreciation, etc.

'Depreciation, depletion, and capital outlays charged to current expense' in the case of the United States includes estimates prepared by the CPRB staff which roughly represent depreciation on government structures.

All the foregoing adjustments were applied to the estimates of national income and gross national product by source of funds. Corresponding changes should be made in estimates by object of expenditure. The effect of the above adjustments may be illustrated by figures for 1943 in Table 1.

The main reason for the large discrepancy between the object of expenditure and source of funds estimates on the United States side is the substitution of William H. Shaw's revised figures on consumers' expenditures for those carried in the gross national product estimates; the substitution of a slightly revised Department of Commerce series on construction for the one carried in the gross national product estimates is also a factor. There are other minor reasons not considered important enough to detail. The absence of a discrepancy in the United Kingdom estimates is due to the method of estimating capital formation — the item is computed as a residual.

The adjustments outlined above were selected because it was understood that they would be approximately those which have been agreed upon by the responsible parties in each country charged with preparing the official estimates. It was expected

TABLE 1

National Income and Gross National Product Adjusted Estimates
United Kingdom and United States, 1943

	UNITED KINGDOM		UNITED STATES	
	White Paper basis	CPRB report basis	CPRB report basis	Commerce Dept. basis ^a
	£ million		\$ billion	
Employees' income	5,349	5,421	110.9	105.2
Additions to corporate surplus			20.9	4.9
Net rents & entrepreneurial profits	2,730	2,739	29.0	27.7
Interest & dividends			7.9	10.1
National income	8,079	8,160	168.7	147.9
<i>Minus:</i>				
Income received from abroad	...	...	.1	...
<i>Plus:</i>				
Depreciation, depletion, & capital outlays charged to current expense	475	475	12.0	9.0
Discrepancy between sources of funds & object of expenditure estimates	...	...	4.8	1.2
Other adjustments	...	...	...	28.4 ^b
Gross national product	8,554	8,635	185.4	186.5

^a *Survey of Current Business*, April 1944.^b Business taxes and bad debt charges.

that, in view of the Tripartite Discussions described in Part I, revisions somewhat along the above lines would be incorporated in the official statistics.

Various component ratio comparisons were made on the basis of the adjusted global figures. These involved national income and gross national product on an object-of-expenditure rather than a source-of-funds basis. National income was divided three ways on an object basis: income devoted to (1) consumption; (2) war; (3) nonwar capital formation. For this division it was necessary to deduct estimated indirect taxes from the gross expenditure estimates. A special allocation of the United States indirect taxes was prepared by the Commerce Department: (1) by assigning to consumption taxes levied on consumption goods and services and (2) by prorating the remaining indirect taxes on (a) government war procurement and contract construction, (b) government nonwar procurement and contract construction, (c) net private domestic capital formation, (d) net exports of goods and services plus net exports and monetary use of gold and silver, and (e) consumer expenditures (Table 2).

TABLE 2
 Comparison of the Use of National Income
 United Kingdom and United States, 1944

	UNITED KINGDOM £ million	UNITED STATES \$ billion
Income devoted to:		
Consumption	4,752	107.3
War	4,493	86.3
Nonwar domestic capital formation	-178	-6.9
Net new external credits & additions to gold stocks	-655	-2.2
Total	8,412	184.5

Figures are net of indirect taxes.

An intercountry comparison of income devoted to capital formation as a percentage of total income (or rather of the extent to which national income has been supplemented by a draft on national wealth) based on the figures in Table 2 is subject to two serious qualifications:

Net capital formation represents gross capital formation less normal charges for depreciation, depletion, and replacement expense. In addition to such normal charges it is important to take account of such special wartime items as bombing damage and the sinking of merchant ships by enemy action; and perhaps too of the more intensive use of industrial plant and equipment. Since the first two items are particularly important in the case of the United Kingdom, the extent to which its capital has been depleted in recent years is materially understated in the national income figures, perhaps by 30 percent.

In distinguishing between income devoted to war and to capital formation, a variety of expenditures treated in Table 2 as for war purposes may, in fact, provide items that will add to postwar national wealth; e.g., (a) construction and equipment of munitions plants; (b) construction and equipment of air fields, hangars, etc; (c) construction of emergency housing in war centers; (d) construction of barracks, military hospitals, etc.; (e) merchant ship construction; (f) increase in war inventories (materials, goods in process, etc. in the hands of manufacturers); (g) production of military goods such as trucks and communication equipment. It is difficult during the war to value the surpluses that may subsequently be left under these headings on a basis that will indicate their contribution to non-war capital formation. The fact that they exist, though they

cannot be valued as capital formation in the year they are produced, tends to indicate that nonwar capital formation is underestimated during wartime. Rough calculations of the costs of items a, b, c, and e, exclusive of emergency type merchant vessels, totaled for the United States up to the end of 1944 almost \$27 billion. Manufacturers' inventories amounted to perhaps another \$10 billion. Thus, the 1942-44 capital depletion in the United States national income accounts of some \$22 billion could easily be completely offset if war surpluses were to find sufficient postwar uses at home or sufficient demand abroad.

In the case of the United Kingdom's figures it is believed that such offsets to capital depletion have been much less important. One reason has been the reliance of the United Kingdom upon the conversion of existing facilities rather than upon the creation of new facilities to meet war needs; another, the relatively greater proportion of war expenditures in the United States devoted to munitions production.

In view of these considerations the CPRB report concluded (p. 2): "In all three countries addition to the stock of nonwar buildings and capital equipment ceased, many capital goods were not replaced as they wore out, and business inventories of civilian goods were run down. When peacetime uses of war surplus property (munitions plants, army trucks, merchant ships, etc.) are taken into account, however; only in the case of the United Kingdom was there a net reduction in national wealth, i.e., in productive capacity and command over foreign resources, and there the reduction was a material one".

An attempt was also made to compare consumed income as a component of total income in the United Kingdom and the United States. Treatment of lend-lease aid complicates comparisons of consumption. It is important to bear in mind that United States aid to other countries has been included in United States income received and the aid received by the United Kingdom excluded from the United Kingdom total. To make the consumption figures comparable, international aid received by the United Kingdom for consumption purposes is added to its consumer expenditures and subtracted from its war expenditures. This is the established White Paper procedure. However, in the case of the United States, the income devoted

to war that represents international aid is not strictly income received. On the other hand, since the United Kingdom figure does not include international aid received (war expenditure is decreased by the amount consumption is increased) total national income does not represent income received to the extent of such aid.

To determine the quantity of international aid received by the United Kingdom alone is difficult, particularly when it comes to military items. Is a tank lend-leased to British forces in Egypt aid to the United Kingdom or to Egypt? What if the forces are Australians? What about a tank going to British troops operating under an American general? The concept of *national income received* becomes blurred during a war in which several nations are engaged in a common cause.

Table 2 in effect assumes that 'international aid' does not influence the external debt or credit of a country. To the extent that such 'aid' provided by the United States (less reverse lend-lease) may eventually give rise to a new funded indebtedness of the United Kingdom to the United States, the war expenditures and capital depletion of the latter are overstated, and those of the former understated. For such 'aid', viewed in retrospect, should have been considered part of United States nonwar capital formation — that is, an addition to the United States external credit — rather than part of United States war expenditures; and conversely, any postwar acknowledgment of indebtedness on account of wartime 'aid' would retroactively add to United Kingdom war expenditure and capital depletion. Until a final settlement is made on lend-lease account, national income statistics for the war years must remain tentative and subject to revision so far as they are taken to measure changes in national wealth. International indebtedness after World War I raised similar difficulties.

Broadly, these difficulties may be summed up as inhering in (a) the difficulty of determining at the time the addition to or depletion of the world's wealth during a war year; (b) the fact that deferred redistributions of national claims on total wealth due to wartime transactions may be made long after the war is over. The first difficulty may be largely confined to the war and immediate postwar period; the second cannot. Moreover, this second difficulty has its peacetime analogue. Deferred redistri-

butions of national claims on world wealth may be caused by a world depression as well as by a world war.

So much for problems of comparing income component ratios. In connection with the CPRB report, an attempt was made also to develop certain gross national product component ratios. For this purpose it was proposed that the gross national products of the two countries be allocated to four components: non-war exports; war production; domestic capital formation; consumption.

This type of analysis of gross national product and the analysis of national income in Table 2 start from different viewpoints. The expenditure analysis in Table 2 applies to the income received; had the gross national product analysis illustrated in Table 3 been on a net basis, it would have applied to national income produced. It shows the types of product derived from an economy rather than the types received by it. The purpose of such an analysis is a short time one — to show what a nation can do in the way of a war effort, that is, what the other forms of product are that might conceivably be decreased in order to devote additional resources to war production.

TABLE 3
Uses of Gross National Product
United States, 1943

	\$ BILLION
Nonwar exports	2.1
War production	79.1
Domestic capital formation	5.9
Consumed domestic product	98.3
Total	185.4

Figures for each item are net of estimated indirect taxes and imports.

An intercountry component ratio comparison based on this type of analysis avoids to a large extent the difficulties discussed above. But it encounters others. It is necessary to allocate not only indirect taxes but also imports. Because of difficulties in the latter allocation, figures were not completed for the United Kingdom.

The comparisons used in the report, therefore, were crude ratios, i.e., the numerator was war outlay less estimated indirect taxes but not less imputed imports. The resulting ratios in

1943 and 1944 — for the United Kingdom (and Canada) about one-half; for the United States, 40 to 45 percent — are subject to two main qualifications, which in part at least neutralize each other.

The ratios, particularly that for the United Kingdom, may be overstated because of included imports. But even had it been possible to determine the extent of the overstatement due to this factor, the fact of imports would still lead to incomparability. Because the United Kingdom imports relatively more of the necessities of life, it was able to devote relatively more of its resources to war production. This suggests that a limit to the percentage of total product going to war may be imposed by strategic and tactical considerations such as insular position and the status of submarine warfare.

The price structures of the two economies differ materially. There is reason to think that, were it feasible to value all United States production at United Kingdom prices, the ratio of war product to total gross national product for the United States would be lower than it is at United States valuations. This consideration applies particularly to military pay, and in less degree to munitions prices.

In interpreting the war-product component ratio there is need to consider not only these two qualifications but also other factors, including (a) prewar excess capacity as indicated by the percentage of the labor force that was unemployed; (b) how long the war component ratio was at a given level.

Broadly, the ratios of war product to total product seem consistent with information on employment. Nonfarm civilian employment was allocated in accordance with rules of allocation that could be applied to the data for both countries. If all agriculture is classified as nonwar, the ratio of military plus civilian war employment to total employment for the United States for June 1944 was 41 percent, slightly lower than the United States war product ratio given above; the corresponding ratio for the United Kingdom was 55 percent, slightly higher than the United Kingdom war product ratio. In view of the relatively larger proportion of the United Kingdom labor force in the armed forces and the relatively larger proportion of the United States labor force on farms these relations are not surprising.

The problems of comparing component ratios disclosed by the CPRB report are dominated by wartime factors. Nonetheless, one may venture to draw conclusions of peacetime significance. It will seldom be safe to overlook the possibility that such a comparison is distorted because the concepts are not identical for different countries or because the component measured is not precisely the component it is desired to measure. Differences in price structure are also likely to distort peacetime comparisons. And it would be strange indeed if for any particular comparison there were not other distorting factors that require consideration in interpreting the component ratios.

2 COMPARABILITY OF MEASURES OF INTERTEMPORAL CHANGES

Among the various types of intercountry comparison, comparisons of intertemporal changes in physical volume measures entail relatively little in the way of intercountry cooperation in statistical effort. Something short of complete agreement on concepts may be permitted. And the same techniques of physical volume measurement need not be used by both countries for any given category.

On the basis of physical volume measures relating to consumption levels the report concluded (p. 1): "(1) In the United Kingdom aggregate per capita purchases of consumer goods and services valued at prewar prices decreased between 15 and 20 percent from 1938 to 1941, and during the following 3 years remained slightly below the 1941 level.

(2) In Canada and the United States aggregate per capita consumer purchases measured on an approximately comparable basis were in 1943 and 1944 ten to 15 percent higher than in 1939. Such purchases were at about the same level in 1943 and 1944 as in 1941." ²

It was originally hoped to provide physical volume measures for all major components of gross national product and so to be able to present an intercountry comparison of the percentage increase in production from before the war to 1944. In addition

² The report called attention to the difficulty of finding comparable base years for such comparisons: "In respect to the level of employment, 1941 for Canada and the United States is a base year more closely comparable to 1938 in the United Kingdom than is 1939 for these two countries."

to the measures of physical volume relating to civilian consumption just cited, the report presented such measures for munitions production. Many years could have been taken as a measure of the part of gross product represented by the armed forces. For purposes of arriving at total gross product, measures of war construction and nonwar capital formation are needed. These were not available for the United Kingdom. However, even had they been available, a major problem would have remained — what weight should war product have in relation to the nonwar components of total national product? With respect to total product the report merely suggests “a 60 to 70 percent increase in Canada and the United States and a materially smaller percent increase in the United Kingdom”.

So far as future years are concerned, both these major difficulties should shortly be overcome. We may confidently hope that during the next decade or so war product will be so small that reasonable differences in its weighting will make little difference in the total; also, that direct estimates of United Kingdom capital formation will soon become available. In the not too distant future we should be able to compare year-to-year changes in the physical output of the two countries.

The problems encountered in this type of intercountry comparison for consumption and for munitions production in connection with the CPRB report concern largely the technique of physical volume measurement, problems that have no special aspect so far as intercountry comparisons are concerned. Consequently, they may be passed over here, though it is not intended thereby to minimize their difficulty or the extent of controversy in this area.

Because the physical volume measures for each country were made separately for the CPRB report, the committee encountered some problems in arriving at a common judgment of the resulting comparisons.

Joint effort in the development of this type of comparison was exerted chiefly in fixing a standard object classification for consumer expenditures. It was necessary to work out the details of this scheme of classification so as to minimize the extent to which existing materials on the two sides needed to be reworked

and yet avoid serious divergence in the definition of categories.³ Had it been possible for Canadian representatives to participate in this task, three-way standardization would have been attempted, which would clearly have increased the problems. And, if in the future a standard scheme of classification is to be adopted under the aegis of the Social and Economic Council, clearly some — perhaps all — countries will have to change their statistical ways. But equally clearly such a standard classification is essential for both comparisons of intertemporal change and direct intercountry comparisons.

The adoption of any such scheme of classification entails the adoption of a definition of consumption and implies the adoption of a line of demarcation between consumption on the one hand and savings and capital formation on the other. In the case of the definition used in the CPRB report, measures of housing for the consumption category are in terms of the inventory of occupied dwelling units and rental values, not in terms of purchases. For all other consumption categories the measures are in terms of purchases and purchase prices; thus changes in consumers' inventories of all goods except dwellings are excluded from savings and from capital formation.⁴

Since this definition of consumption, which has definite advantages with respect to considerations of statistical expediency, has been widely used and is open to theoretical objection, the difficulties it entailed are of interest here. For all major commodity categories other than food, drink, and tobacco, purchases are an inadequate measure of consumption. Thus although the neglect of consumer inventories characterized the measurements for all three countries, for purposes of intercountry comparison it became necessary to note how long new

³ Shaw's estimates of consumer expenditures for the United States were in general sufficiently detailed to permit their regrouping so that United Kingdom and United States categories could be made approximately comparable.

Restaurant meals required special treatment. The United States consumption expenditure estimates included under food the entire cost of restaurant meals. The United Kingdom estimates included under food only the estimated food cost of such meals; the remaining cost was assigned partly to miscellaneous services and partly to other groups. To bring about approximate comparability, one-half the value of restaurant meals in the United States was assigned to miscellaneous services.

⁴ Strictly speaking, food consumption includes more than purchases. For example, home produced food for the farmer is included.

supplies had been curtailed in relation to the normal life of an article such as a suit of clothes. During the war purchases decreased more than use in the case of automobiles and household metal products in all three countries, and in the case of clothing and household textiles in the United Kingdom.

One conclusion of the CPRB report reads in part (pp. 2 and 3): "Per capita consumption of foods, valued at prewar prices, increased in the United States and Canada and decreased in the United Kingdom. In the latter country substantial readjustments of diet were necessary, but nutrient standards were in general maintained. Purchases of civilian clothing, of household soft goods, and of a miscellany of commodities, including cosmetics, toys, jewelry, stationery, and other paper products, increased in the United States and Canada and decreased in the United Kingdom. The low level of purchases of clothing and household soft goods was so long continued in the United Kingdom that by 1943 and 1944 consumers' wardrobes and linen closets included a large proportion of items that even by wartime standards in the United States and Canada would be classed as worn out."

The type of consumption measurement used in the case of housing was not satisfactory; it overstated the wartime level of consumption partly because quality deterioration was inadequately portrayed, particularly in the case of the United Kingdom, and partly because of a poorer distribution of housing during the war. The latter difficulty may be explained by an extreme example; in effect it treats two situations as equal in housing consumption: (a) 8 persons, 4 in each of two houses, and (b) 8 persons, 3 in each of two houses, and 2 with no housing accommodation at all. This distributive type of defect in consumption measures applied also to other consumption categories, particularly to the more durable consumer goods, new supplies of which were sharply curtailed, and to fuel.

A passage from the chapter of the CPRB report dealing with housing may be cited in this connection (pp. 38-9): "In the case of housing, consumption levels are particularly difficult to measure. No measurements have been attempted in this report for Canada. The measurements presented for the United Kingdom and the United States, in general, tell only the brighter side of the story. They show that there were more occupied dwelling

units in 1944 per thousand civilians than before the war. In the United States they show more occupied dwelling units per thousand civilians as an average, even for the six hundred-odd counties in which the civilian population increased during the war by in-migration from the rest of the country.

No good measures are available for either country to reveal the extent to which those persons who had to seek new quarters (e.g., in the United Kingdom because of bomb damage, or in the United States because of moving to a war production center) were unable to find suitable accommodation. Nor is there direct statistical evidence of the deterioration in the quality of dwellings which, particularly in the United Kingdom, is known to have occurred during the war."

Another difficulty encountered in consumption measures arises from classing as consumer expenditures some items that are properly deductions from wages, e.g., costs of work-clothes and of travel to and from the job. So far as this difficulty was common to the United Kingdom and the United States, it did not invalidate the intercountry comparisons.

The difficulties so far discussed are encountered in peacetime as well as wartime comparisons. One difficulty of little consequence in peacetime arose because the CPRB report focused on civilian consumption, not on total consumption. On this point the report says (p. 3):

"It has not been possible in some consumption measurements to separate civilian purchases from purchases by members of the armed forces, and there is reason to believe that in the case of such items as beer, amusements, railway travel, and communication services the average serviceman's expenditure was considerably above that of the average civilian. Thus, the increases in per capita purchases shown for these items overstate the true change in civilian consumption. This is particularly so in the case of the United Kingdom, where the number of troops, British and Allied, in that country was proportionately larger than in the United States and Canada."

This review of the CPRB's experience with intertemporal measures suggests the need to improve measures of consumption, savings, and capital formation. Existing measures overstate the cyclical fluctuations of consumption and understate the cyclical fluctuations of savings and capital formation.

Automobiles and probably several other consumer durables can be handled much as owner-occupied dwellings are now handled. This treatment, though not entirely satisfactory, is better than that now customary. Alternatively, a compromise between the two might be argued for. Further, some costs now classed as consumer expenditures can be clearly identified as costs of employment; such costs should be deducted from payrolls, not included in national income. But there will probably always be serious defects in our measures of consumption, especially in any definition of consumption that can be promulgated as an international standard. Economists concerned with the behavior of such measures as the savings-income component ratio will do well to keep these defects in mind.

3 DIRECT INTERCOUNTRY COMPARISONS

In the CPRB report attempts were made to develop direct intercountry comparisons of three major components of gross national product: absolute levels of civilian consumption; absolute levels of munitions production; absolute equivalents of the pay and subsistence of the armed forces. Strictly, the items compared were slightly too gross inasmuch as it was not feasible to deduct imputed imports.⁵ However, such a deduction for the purpose of direct intercountry comparisons might be thought of as applicable to the total.

Theoretically, the problem of an intercountry comparison of consumption for a given category of consumption (or for war expenditures) is analogous to that of comparing estimates for two years for the same country. Two general approaches to such absolute comparisons are possible.

Value figures at current prices for the two countries may be used and a correction applied to one, so as, for example, to convert 1938 pounds sterling into 1939 United States dollars. Such an interspatial deflation is analogous to the more familiar intertemporal deflation.

Physical volume value aggregates for the two countries may be computed, using the prices of either country as weights. Such a comparison gives essentially an interspatial physical volume index.

⁵ 'Indirect taxes less subsidies' were not deducted either. However, this item affects intercountry comparisons only as it affects the relative weights of the components.

Under some conditions the deflation and the physical volume techniques, using data for either country as weights, give results not widely different. In other words, aggregative type indexes may be used without resorting to such a device as the 'ideal formula'. However, if, when price and physical volume relatives are computed for the various items of consumption, the dispersion is large, the interspatial measures may diverge and the need to strike some sort of compromise may be urgent.

In general, the dispersion of price and physical volume relatives is likely to be greater in the case of intercountry than of intertemporal comparisons. Baskets of goods and relative prices are likely to differ more sharply between countries than between near-by periods in one country. Thus, a gradual shift from coal to oil heat in the United States may not greatly distort a temporal comparison of heating standards in the United States; while the fact that virtually no oil is used in the United Kingdom seriously complicates an intercountry comparison. Hence the use of the 'ideal formula' or some other compromise is more likely to be needed in intercountry comparisons. Equity between the two nations to be compared is a further argument for the 'ideal formula'. Each nation may feel that unless its own prices and quantities are used as weights, its situation will be unfairly presented.

Intercountry comparisons of consumption levels were attempted on the following groups of the standard object classification adopted for the study: food, alcoholic beverages, tobacco, footwear, fuel and electricity, housing, clothing, and household goods. A very rough attempt was made for motor vehicles and their operation and a comparison was available for newspapers. Most of these comparisons were on a physical volume basis. In each case per capita figures were compared, the population base being varied appropriately from group to group (see Table 4).⁶

In the case of foods, only United States prewar prices were used. Special reports by a Combined Food Board committee compared prewar and wartime consumption for many groups of foods. For each country the pounds (or other quantity) of the

⁶ Thus the population base used in the case of expenditures on men's civilian clothing was male civilians, aged 4 and over in the United Kingdom and aged 5 and over in the United States.

category of food consumed annually per capita were given. The task performed by the Combined Food Board committee in putting these measures on a comparable basis was a considerable one. For example, if beef consumption is to be measured in pounds, the measures must be on the same basis for both countries (live weight, dressed weight, retail cuts) or conversion factors must be developed.

For the purposes of the CPRB report, the intercountry food comparisons were made from the Combined Food Board computations by a shortcut method. The Bureau of Agricultural Economics had valued each article of food consumed in the United States in the five-year base period at prewar retail prices. Mainly on the basis of these computations, a United States prewar value per pound for each of 22 categories of food was determined. These unit values were applied to the Combined Food Board physical volume measures to derive prewar value aggregates for the United Kingdom and wartime value aggregates for both countries. It was not deemed feasible in the case of food to attempt a comparison using United Kingdom price-weights but it may be doubted that the showing would have been materially different.

For several of the other comparisons, however, the use of the 'ideal formula' proved very significant. That is to say, the use of the United States and United Kingdom prewar weights gave markedly different results; e.g., for alcoholic beverages and tobacco where price differentials were very much affected by excise taxes.

For footwear three comparisons were made: one based on physical volume data and United States prewar wholesale values, one on physical volume data and United Kingdom prewar wholesale values, and one on deflated expenditures. The physical volume comparisons used data for 6 categories of footwear. Expenditures were deflated by computing an average exchange rate. Constituent exchange rates were based on prewar prices (in shoe stores catering to working class families) of men's work shoes, men's street shoes, women's street shoes, boys' shoes, and girls' shoes in both pounds and dollars. The median rate of these five exchange rates was used to convert United Kingdom expenditures on footwear into dollars. The two physical volume value aggregate ratios, one in pounds, the other in dollars, were

close. The ratio of the dollar value of purchases in the United Kingdom to that in the United States based on the median exchange rate was somewhat lower. The mean of the two value aggregate ratios was adopted. All three comparisons may have been biased in the same direction by differences in the quality of footwear in the two countries.

The quality question was important also in the case of tobacco. An English and an American cigarette were taken to be equivalent; so was an ounce of smoking tobacco. However, the difference in quality of cigars was so marked that it seemed unwise to take an American cigar as equal to an English cigar. First, a preliminary comparison was made on the basis of cigarettes and smoking tobacco alone. Then each side of the comparison was increased by the ratio of total expenditure on tobacco to expenditure on cigarettes and smoking tobacco.

For fuel, only a single method of comparison was attempted. Here the measurement was in terms of the BTU content of the various fuels consumed instead of in terms of price weights. The comparison in terms of BTUs showed prewar residential consumption in the United Kingdom to be some 8 percent higher than in the United States. Had comparison been made on a value basis, United States consumption would have appeared larger in relation to United Kingdom consumption because of the high money value per BTU of gas and electricity and of the higher per capita consumption of these sources of energy in the United States. In any case, such a comparison must be qualified because of the differences in climate. An additional comparison, omitting the sixteen southern states and the District of Columbia from the United States figure, showed the number of BTUs used in residences per capita in the northern and western United States before the war to be about 25 percent higher than in the United Kingdom.

For only a few items of clothing and household goods were physical quantity data available for the two countries. Rough comparisons were based on deflations of the expenditure data. For each group retail prices applicable to working men's families were obtained for some forty items. A longer list had been made, but the difficulties in obtaining prices for even roughly comparable specifications on the two sides were considerable, and various items had to be rejected. The median price of vari-

ous quotations was used for each item. The resulting forty exchange rates for the two groups were widely dispersed; e.g., in clothing, the purchasing power of the dollar in terms of pounds was much lower for woolen items than for cotton.

The Bureau of Labor Statistics determined a median for each of the two sets of forty exchange rates based on a rough weighting of the various items in accordance with United States prewar consumer expenditures. These were used to provide interspatial deflators of per capita consumer expenditures on clothing and on household goods respectively. An attempt was made also to obtain exchange rates for a miscellaneous category of goods designated in the CPRB standard object classification as 'other personal effects' (perambulators, jewelry, cosmetics, sport goods, luggage, watches, etc.). Although quotations on both sides were obtained for fifteen items, it was felt that they were inadequate as a basis for a comparison.

The comparison for housing was based simply on the number of dwelling units per capita with no allowance for differences in quality. For automobiles, a rough attempt to fix limits on the relation of the United Kingdom consumption level to that in the United States was based on gasoline consumption, number of cars in operation, and number of new cars. The difference in weight of car and in gasoline consumption per mile in the two countries makes such a comparison difficult, but by any of the three criteria United Kingdom consumption before the war was clearly a small fraction of that in the United States and it was difficult to make any reasonable assumption for weighting the three criteria that would show United Kingdom consumption to be more than 25 percent of that in the United States or less than 15 percent. The figure in Table 4 (20 percent) may thus be subject to a 25 percent margin of error.

Because marked divergence in aggregative measures was frequent and because the margin of error in all the comparisons may be substantial, it seemed best to show each comparison rounded to the nearest multiple of 10 percent. The area covered by these intercountry comparisons, accounting for about 75 percent of total consumer expenditures in both countries before the war, indicates the over-all levels in the two countries. By means of the interspatial indexes for each area (the United Kingdom on the United States as a base) United States prewar expend-

itures were computed in pounds from United Kingdom prewar expenditures, and United Kingdom prewar expenditures were computed in dollars from United States prewar expenditures. Two preliminary composite indexes for the areas covered were computed and the geometric mean was taken as the final composite index for all areas of consumption covered (Table 4, last line).

TABLE 4

Direct Intercountry Comparisons of Per Capita Consumption Levels

	UNITED KINGDOM CONSUMPTION IN 1938 AS % OF UNITED STATES CONSUMPTION IN 1939	IMPLIED EXCHANGE RATE (\$ per £)
Food	90	3.75
Alcoholic beverages	80	4.00
Tobacco	80	3.00
Clothing other than footwear	100	5.67
Footwear	100	6.00
Housing	100	6.67
Fuel and electricity *	110	5.75
Household goods	80	5.00
Motor vehicles and their operation	20	3.00
Above groups taken together	80 to 90	4.67

* The comparison with the United States excluding the southern states is about 80 percent.

In the absence of comparable data on either prices or physical volumes for the other consumption items, arbitrary assumptions may be made regarding the appropriate exchange rate to apply as a deflator for this area in getting an over-all comparison of consumption levels. If the exchange rate applicable to the area not covered lies between \$2.50 and \$7.50 per pound, then, accepting a figure of 84 percent for the covered area, the over-all British consumption level on the United States base must lie between 71 and 91 percent. On this basis the CPRB report concluded (p. 1): "In 1938 and 1939 the physical volume per capita of consumer purchases was probably between 10 and 20 percent lower in the United Kingdom than it was in the United States; with the wartime rise in the United States and fall in the United Kingdom the difference between levels in the two countries materially widened."

Despite the numerous qualifications that must attach to the comparisons for the several areas of consumption because adequate account of quality differences cannot be taken and be-

cause the information in several areas is incomplete, this general result is deemed reasonable.

As has been noted, from prices for comparable articles and value weights an exchange rate applicable to a given category of consumption can be constructed. An interspatial price index, it can in turn be used to convert United Kingdom consumer expenditures into dollars or United States expenditures into pounds. Conversely, given United Kingdom per capita expenditures on, say, food in pounds, and United States per capita food expenditures in dollars, and assuming that the United Kingdom consumption level is, say, 90 percent of that in the United States, an exchange rate for food can be computed from the formula: % U. K. food consumption is of U. S. consumption =

$$\frac{\text{U. K. per capita food consumption in pounds}}{\text{U. S. per capita food consumption in dollars}} \times (\text{exchange rate for food in \$ per } \pounds)$$

The over-all implicit exchange rate, \$4.67 per £, applicable to total consumption covered by Table 4, was similarly computed from the expenditure totals and the total consumption ratio. The implicit exchange rates range from \$3.00 to \$6.67. On a more detailed basis, of course, the range of dispersion would be somewhat wider. For example, in the case of the directly measured rates for clothing the range was from \$1.96 to \$10.25 per pound.

The differences when dollar and pound weights were used were also large. In the case of alcoholic beverages the index using pound weights was 70 percent and that using dollar weights, 94 percent. Similarly, in the case of tobacco the index for cigarettes and smoking tobacco alone, using pound weights, was 79 percent; using dollar weights, 93 percent. These figures are presented to indicate the dangers in attempting interspatial comparisons of national income on the basis of price index data for broad categories, especially when the indexes fail to cover important items of consumption within categories. A detailed analysis of total consumption, such as that described above, may possibly give a result accurate for total consumption to the nearest 12.5 percent (provided the consumption concept, the interspatial measurement concept, and the periods selected for comparison are not in question). Even that degree of accuracy for such a comparison is far from certain. Any attempt

at interspatial comparison of total national income with much less detailed information using interspatial deflation at a single stroke is extremely hazardous.

Two other interspatial indexes may be described briefly. Two of the principal components of war expenditure are (a) pay and subsistence of the armed forces; (b) purchase of munitions, broadly conceived to include all types of goods (other than subsistence) purchased by government for war uses. To compare the physical quantities corresponding to (a) a very simple type of measurement was used — the number of manmonths in the armed services in each country. Various refinements might be made, but it is doubtful that the result would be greatly different.

For munitions production, interspatial physical volume indexes, covering a major part of all munitions production — over 60 percent for both countries on a value basis — had been computed by the CPRB for some time. To take account of the omitted items United Kingdom expenditures on munitions by the Ministry of Aircraft Production, by the Ministry of Supply, and by the Admiralty were separately converted from pounds into dollars. The exchange rates used for these conversions were based upon the interspatial production indexes already available, which provided, for the items covered in each area, value aggregates for United Kingdom production in both pounds and dollars (Table 5).

TABLE 5

Direct Intercountry Comparisons of 1943 War Product Segments

	ARMED SERVICES	MUNITIONS PRODUCTION
U. K. product as a % of U. S. product	55	25
Implicit exchange rate (\$ per £)	8.67	6.67

Together these direct intercountry comparisons cover the major part of gross national product. Although the components for which direct comparisons are missing constitute a larger fraction of the total than in the case of the intertemporal comparisons, the situation is broadly similar. Domestic capital formation is an important component for which comparison is impossible. No direct intercountry comparison was attempted in the CPRB report for imports and exports, but so far as merchandise is concerned, these present no special difficulty, and

the service items are small relatively. No direct intercountry comparison was attempted for government service (nor were intertemporal measurements compared for this area); but a feasible basis, and one that might pass muster, is afforded by manyear data.

Thus the two chief obstacles to a complete, if rough, direct comparison of the gross national products of the two countries appear to be: (a) the lack of measures covering domestic capital formation; (b) the problem, largely a wartime problem, of the relative weights to assign the war product components.

Because of the central importance of the capital formation category it may be appropriate to speculate briefly about the types of measurement that could be used for it. Though there are substantial difficulties in comparing large portions of construction in terms of output, important segments of capital formation can be measured roughly. For example, intercountry comparisons might include:

For new schools constructed, number of pupil places, number of teacher places, square feet per pupil;

For residential construction, number of dwelling units (possibly using some broad structure-type classification and appropriate weights), number of rooms;

For roads and streets, number of miles constructed and number of miles maintained, both by type;

For various types of industrial equipment and household facilities, number of units by type.

Some, impressed by the difficulties involved, may hesitate to accept the concept of a percentage relation between national levels, or to make an over-all intercountry comparison of gross products, even within so wide a range as ± 12.5 percent. To such persons these proposals will seem objectionable, both because they do not cover all domestic capital formation and because they fail by a substantial margin to take full account of the qualitative aspects of the segments they do cover. Indeed, these objections would doubtless be lodged against the comparisons in Tables 4 and 5 also.

Various considerations may be offered in rebuttal. The comparisons in Tables 4 and 5 and the measures proposed above hardly exhaust the possibilities. The list could easily be extended

on the basis of data one may reasonably hope for. The comparisons in Tables 4 and 5 are practically a maiden effort. Firmer price comparisons, covering many more items of clothing, household goods, and other personal effects, are surely desirable and to be confidently expected. In this direction the CPRB report hardly scratched the surface. Measures of both the inter-spatial deflation and the physical volume variety can be developed for other segments of consumption. The unmeasured area can be materially narrowed and for a substantial area it should be possible some day to check one type of measure against another.

It is important to recognize that failure to take account of qualitative differences is itself a matter of degree. And the degree of failure in a given area can be diminished by improving price specifications, by pricing more items, by dividing quantity data into more detailed categories, and by measuring physical volume in more forms and more refined forms.

It is important also to recognize that the impossibility of measuring a certain segment of gross national product is not a bar to an over-all intercountry comparison for gross national product, or for total consumption. If limits can be set for the missing measure, say ± 50 percent, an over-all comparison, subject to much narrower margins of error, can be made.

These considerations are mentioned to indicate both the feasibility of useful over-all United Kingdom-United States comparisons of consumption and of gross national product and the next steps in their development. But it may be well to repeat a caution sounded at the start — the task of making such intercountry comparisons will be more difficult where the cultural differences are wider than they are between the United States and the United Kingdom.