INTERTEMPORAL COMPARISONS OF REAL NATIONAL INCOME: AN INTERNATIONAL SURVEY[1]

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I. INTRODUCTION

IN the rapidly expanding literature on national income the problems involved in intertemporal comparisons of real national income have not yet been very thoroughly discussed. In recent years the interest in such comparisons has been growing. For various purposes, and particularly where the countries devastated by the war are concerned, there is a need for comprehensive figures showing how the present aggregate output of goods and services compares with the pre-war output of the economy. National income figures expressed in current prices cannot be used for this purpose as they reflect changes in prices as well as in output. To eliminate price fluctuations national income must be computed in real terms, or to use a terminology which is more readily understood in some non-English-speaking countries, national income must be expressed in constant prices. We shall see that different meanings have been attached to this term.

Estimates of real national income are available for a number of countries, including Argentina, Australia, Austria, Bulgaria, China, Denmark, France, Greece, Hungary, India, Italy, the Netherlands, Netherlands Indies, Norway, Palestine, the Philippines, Poland, Sweden, Switzerland and Turkey. In the United Kingdom consumers' expenditure, an important component of the national expenditure, is measured in constant prices, and unofficial estimates of all other components of the national income expressed in real terms have also been published.[2] In the United States evaluations of real national income are being made by the National Income Division of the Department of Commerce, and preliminary figures have been published in the Economic Reports issued by the Council of Economic Advisers.

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[1] The present paper is an extended and revised version of a preliminary draft read before the Econometric Society, Cleveland, Ohio, 28th December 1948.

[2] Dudley Seers, 'The National Product Before and After the War', *Bulletin of the Oxford University Institute of Statistics*, Vol. X, No. 10, October 1948.

A quick survey of this material reveals striking differences in the methods used. Disregarding variations in statistical practices, which may be explained by the peculiarities of basic data available, three main groups of methods may be distinguished:

(a) National income estimates may be expressed in constant prices by 'deflating' the totals by an appropriate price index, such as an index of cost of living, or an index of wholesale prices.

(b) The components of the national expenditure may each be deflated by an appropriate price index, and the series thus obtained combined in one series showing national expenditure in constant prices. If sufficient statistical data on quantities are available the method may be modified by computing quantum indices, using total sales in a chosen base period as weighting coefficients. Other index formulae and more complicated methods of weighting have also been used.

(c) Regarding the national income as a measure of the aggregate output of goods and services, estimates of national income in constant prices may be obtained by combining indices of production for all sectors of the economy, using as weights the net values added of the various industries in the chosen base period.

The three groups of methods indicated will now be discussed in detail.[1] In a later section the measurement of real national income will be investigated in the light of recent discussions on the concept of national income. This will serve as a basis for preliminary proposals to improve international comparability of statistical series showing fluctuations in real income.

II. DEFLATION OF NATIONAL INCOME BY PRICE INDICES

Probably the oldest method used for adjusting the national income 'for changes in the purchasing power of money' consists in deflating the national income in current prices by an appropriate price index. The following table gives a survey of the methods used in ten countries:

[1] Although under certain assumptions the second method may be considered as a refinement of the first, we prefer to treat them as two separate groups. Theoretically at least there is a fourth method, according to which real income is measured on the basis of the contributions of the factors of production, adjusted for price changes. This method may have to be used, for example, in wartime, when the structural changes in the composition of the national product make the application of other methods very difficult.

Methods Used to Deflate National Income

Country	Income Concept	Price Index used as Deflator
Australia .	Domestic national income at factor cost	Index of wholesale prices
Bulgaria .	1. National income at factor cost	Index of cost of living
	2. ,, ,, ,, ,, ,,	Index of wholesale prices
Greece . .	,, ,, ,, ,, ,,	Index of wholesale prices
India .	,, ,, ,, ,, ,,	Various price indices
Netherlands .	,, ,, ,, ,, ,,	Index of cost of living
Netherlands Indies	,, ,, ,, ,, ,,	Indices of cost of living
Palestine .	,, ,, ,, ,, ,,	Index of wholesale prices
Sweden .	Domestic net national product at market prices	Index of retail prices
Switzerland .	Net national product at market prices less direct taxes	Index of cost of living
United States.	Disposable personal income	Consumers' price index

Sources:

Australia. *Monthly Summary of Australian Conditions*, The National Bank of Australia Ltd., 10th July 1948, p. 4.

Bulgaria. (1) Dr. A. Tchakaloff, *National Income and Outlay of Bulgaria, 1924–1945*, Sofia, 1946, pp. 117–18 (in Bulgarian, with summary in English).
(2) *Le revenu national en Bulgarie, 1936–1945*, Haute Chambre d'Économie Nationale, Sofia, 1947 (in Bulgarian, with summary in French). The author (Mr. A. Kemileff) also presents a second series obtained by deflating the income of the rural population by an index of production costs in agriculture and the income of the urban population by the index of cost of living.

Greece. Estimates prepared by the Supreme Economic Council, Athens.

India. Estimates prepared by the Economic Adviser to the Government of India. Income in agriculture has been deflated by an index of wholesale prices of primary products, income in manufacturing by an index of wholesale prices of industrial products, and income from services by an index of cost-of-living.

Netherlands. *Het Nationale Inkomen van Nederland, 1921–1939*, Central Bureau of Statistics, The Hague, 1948, p. 50. The cost-of-living index includes a component for direct taxes.

Netherlands Indies. Dr. J. J. Polak, 'Het nationale inkomen van Nederlandsch Indië, 1921–1939', *Statistische en Enconometrische Onderzoekingen*, Vol. 2, No. 4, December 1947, pp. 104–8. Real income has been measured by deflating the aggregate income of the Europeans, the Chinese (including other alien Asiatics residing in the Indies) and the Indonesians by three different cost-of-living indices and combining the series thus obtained into one.

Palestine. P. J. Loftus, *National Income of Palestine 1945*, p. 14. Net output for domestic market deflated by index of wholesale prices; exports, supplies for H.M. Forces, and deliveries to petroleum concessionaires deflated by index of import prices.

Sweden. Konjunkturinstitutet, Stockholm.

Switzerland. *Das Volkseinkommen der Schweiz*, Eidgenössiches Statisches Amt, Bern, 1948.

United States. *The Economic Report of the President*, January 1949, *The Annual Economic Review*, p. 104.

In six of the ten countries mentioned the income concept used is national income at factor cost, which in three cases is deflated using an index of cost of living. In the literature it has often been suggested that national income at market prices be used on the ground that since consumer prices include indirect taxes the corresponding income concept also ought to include indirect taxes.

Before discussing in greater detail the various aspects of this problem it may be worth while to investigate the effect of the choice of the income concept upon the statistical series obtained for national income in constant prices. Appendix Table 1 shows for six countries national income at factor cost and national income at market prices. Despite the increase in indirect taxes in many countries as compared to prewar, the percentage deviation between the two income series does not seem to have changed very much. The only notable exception is the United States, where the percentage deviation between the two series is smaller in postwar years than before the war. It should be taken into account that in this case the difference between the two series is in part explained by a statistical discrepancy due to the fact that the two series have been estimated independently.

It may be noted that the definitions of indirect taxes and subsidies are not identical in all countries (see note on the definitions of indirect taxes and subsidies appended to the table). A further investigation would be necessary in each case to determine whether taxes considered as indirect in the index of cost of living have also been defined as indirect in estimating national income at market prices.

It follows from the table that for the countries indicated national income at market prices moves rather closely parallel to national income at factor cost. Consequently, it would not make much difference for the movements of the series obtained if one or the other national income series were deflated by an index of cost of living.

To deflate national income at market prices by an index of cost of living is necessarily a crude procedure. The point is that the index refers to consumers' expenditure on goods and services, which is only one of the components of national expenditure. Government current expenditure on goods and services, and capital formation, constitute other important elements. It

cannot be expected that for all components the same index can be used as a deflator.[1]

There are other reasons why an index of cost of living may be inadequate as a deflator:

(*a*) The composition of the national expenditure may have changed so much, for example, as a consequence of a war, that division by a price index based on prewar weights becomes an unsatisfactory procedure.

(*b*) The national income may include imputed items, such as farmers' consumption of own produce, which are either not included in the cost of living index or which are only inadequately covered.

(*c*) Available price indices may relate to specific population groups only, for example, urban wage-earners. For the purpose of deflating consumers' expenditure on goods and services the index must refer to all groups of the population, including entrepreneurs, people in the higher income brackets and the rural population.

(*d*) The cost-of-living index should not include an allowance for direct taxes.[2]

Why indices of wholesale prices have sometimes been used as deflators is not quite clear. Probably it is felt that during and after a war, when prices are strictly controlled in combination with rationing, and the computation of indices of cost of living encounters certain well-known difficulties, wholesale price indices give a better indication of the development of price levels. However, the fact that indices of cost of living may be kept down by subsidies is not an argument against their use, since they may be related to income at market prices which includes indirect taxes but excludes subsidies. It is interesting to observe

[1] It is sometimes argued that the index of cost of living may also be used to deflate other components, such as, for example, personal saving, on the ground that consumers have the choice between saving or spending. If one wants to follow the argument the index would have to refer to prices of goods and services consumers would have bought if they had not saved. This index may be very different from the cost of living index.

[2] The cost-of-living index for the Netherlands is constructed in this way. If prices for consumers' goods and services go up, the average family of the budget inquiry from which the weights for the index have been derived would move into a higher income class if its real income were to remain unchanged. In the higher income bracket direct taxes would be higher owing to the progressivity of the tax. Inclusion of an allowance for direct taxes will thus increase somewhat the fluctuations of the cost-of-living index.

that for a country such as Australia, in which strict price con-
trols and rationing, combined with government subsidies, were
maintained during and immediately after the war, it does not
make much difference if national income at market prices is
used instead of national income at factor cost. The conclusion
must be that in this case the index of cost of living is inadequate
as a deflator, not because it is based on prices less subsidies, but
because it is probably not duly representative of prices of all
finished goods and services.

III. MEASURING THE COMPONENTS OF THE NATIONAL EXPENDITURE IN CONSTANT PRICES

National income may be expressed in constant prices by ad-
justing each of the components of the national expenditure for
price fluctuations. From a theoretical point of view this pro-
cedure may be more satisfactory than any other method used.
We will come back to this point in Section V.

Few countries have applied the method and the information
about the techniques used is usually brief. In Denmark (domes-
tic) gross national product has been expressed in prices of 1935
by the following method.[1] Consumers' expenditure and govern-
ment expenditure on goods and services have been deflated by
the cost-of-living index, construction by an index of building
costs, and outlay on machinery by an appropriate wholesale
price index. The exports surplus of goods when positive has
been deflated by a wholesale price index of exports, and when
negative by a wholesale price index for imports. Net receipts
from freight have been deflated by an index of freight rates.
Deflating of net interest and dividends received from abroad
was not necessary, since the item does not appear in domestic
gross national product.

It may be argued that in an expenditure breakdown the net
foreign investment component should be deflated by an index
of import prices instead of by an export price index. The point
will be taken up again in Section V.

In the United Kingdom consumers' expenditure has been
expressed in constant prices by expressing each of its compon-
ents in constant prices and combining the series thus obtained

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[1] *Nationalproduktet og Nationalindkomsten 1930-1946*, Copenhagen, 1948,
Chap. VI, pp. 153–69.

into a quantum-index, using estimates of the value of consumption in the base year as weights. Sometimes a more complicated formula for a quantum-index has been used. However, it is desirable that any formula used fulfills the criterion of additivity, i.e. that the weighted sum of the quantum-indices for all components equals the quantum-index for consumers' expenditure on goods and services as a whole.[1] The simple base weighted aggregative quantity index satisfies this criterion.

Estimates of domestic capital formation based on a quantity index are available for Sweden.

Government expenditure on goods and services is usually difficult to deflate. Whereas government expenditure on goods may, at least in theory, be deflated by an index of prices, government outlay on salaries is usually deflated by an index of salary rates of government employees, thus implying the assumption that the productivity of labour has not changed.

Estimates of consumers' expenditure on goods and services, expressed in constant prices, have also been prepared for France and Sweden. Available estimates for Czechoslovakia refer to the Czech lands only, excluding Slovakia.

In the expenditure breakdown all items are usually expressed at market prices, i.e. including indirect taxes but excluding subsidies. It is possible to define all expenditure items *ex* indirect taxes less subsidies, and if this is done the aggregate national expenditure will be equal to national income at factor cost. If national expenditure at factor cost is expressed in constant prices the result is not necessarily the same as when national income at market prices is adjusted for price fluctuations. The differences are easily explained by the unequal incidence of indirect taxes less subsidies upon the various goods and services entering into the national expenditure.

It is easier to express gross capital formation in constant prices than net capital formation, which is equal to the gross concept less replacement investment. It is usually not known, and may even not be feasible to establish, what capital goods are meant for replacement and what part of capital formation is meant

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[1] J. R. N. Stone draws attention to this point (cf. 'The Measurement of National Income and Expenditure', *Economic Journal*, Vol. 57, No. 227, September 1947, pp. 272–98). It appears from this article (cf. pp. 287–88) that the indices of prices and quantities used in the British White Papers on National Income and Expenditure previously were 'ideal' index numbers. From 1946 on, base-weighted quantity indices have been used to satisfy the criterion of additivity.

for new investment. The reason is that these concepts are essentially macro-economic.

The best procedure for all practical purposes probably is to consider total depreciation allowances broken down by industrial sectors, to adjust them for replacement values if this has not been the basis of valuation, and to deflate by price indices of capital goods for each separate industrial sector.

IV. MEASURING REAL NATIONAL INCOME AS A COMBINED INDEX OF THE OUTPUT OF GOODS AND SERVICES

Many authors have attempted to measure real national income on the basis of indices of agricultural and industrial production and similar data for the service industries and other branches of the economy, including the government sector and the net return from investments abroad. The indices for separate sectors may be combined into a general index, using the net values added in the chosen base period as weights. However, other systems of weighting have also been applied. Statistical practices in various countries differ widely, and it may be doubted whether the methods used are always consistent in themselves. In *Argentina*[1] indices of production were used for agriculture and mining, but for manufacturing an index of employment was used, changes in productivity thus being neglected. Services of the government in the non-business sector are measured by the total number of government employees, and a similar method has been followed with respect to the personal services. The services of banks and other financial intermediaries have been left out. The assumption has been made that the volume of their services moves parallel to the combined volume index of all other branches. In general, the indices for the various industries have been weighted according to the values of the output in the base year (1935). For trade, the gross profit margin was chosen, and for the government sector and other service sectors the total payroll.

The index of real national income computed by Dr. Kiranoff for *Bulgaria*[2] is a combined index, obtained from indices of agricultural production, mining and manufacturing. As the out-

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[1] *La Renta Nacional de la Republica Argentina*, Banco Central de la Republica Argentina, Departementa de Investigaciones Economicos, Buenos Aires, 1946.
[2] Dr. P. Kiranoff, *Le revenu national en Bulgarie*, Sofia, 1946.

put of small industries and handicrafts was difficult to measure, the index for this group was assumed to have remained constant (the index of manufacturing also did not fluctuate very much during the war years). For all other branches, i.e. transport, communications, trade, government and income from capital, it was assumed that the index of the volume of services rendered had fluctuated parallel to the combined index of agricultural and industrial production.

Estimates of real national income for *China*, prepared by Dr. Pao San Ou,[1] are based on indices of production for agriculture, manufacturing and mining, and similar data for transportation. For the government non-business sector, education, banking, insurance and personal services the index is based on the number of people employed without adjustments for changes in productivity.

In *Hungary* estimates of real national income were derived from indexes of production, each product being weighted by the average price in the base period.[2] Manufacturing output, however, was weighted according to the net value added in the base period. With respect to handicrafts and domestic industry, the assumption was made that output varied in proportion to the combined value of agricultural output, mining and manufacturing. For transport, total number of ton-kilometres was used as an index. The contribution of commerce to real national income was estimated on the basis of the quantity of goods passing through trade channels, and this was derived from indices of output of agriculture, mining and manufacturing industry and imports of finished goods. Finally, it was believed necessary to take into account the price-increasing effect of indirect taxes. To this end the percentage of such taxes in the total nominal value of the production of consumers' goods in the base year was obtained and added to the corresponding volume indexes for all years. Services rendered by dwellings were estimated on the basis of the number of dwelling units, using the aggregate rental value as weighting coefficient. The volume of domestic work was supposed to have remained constant. Items of the balance of payments entering into the national

[1] Dr. Pao San Ou, *National Income of China, 1933, 1936 and 1946*, Social Sciences Study Papers, No. 1, Institute of Social Sciences, Academia Sinica, Nanking.
[2] Matolcsy, M. and Varga, S., *The National Income of Hungary, 1924/25–1936/37* (translated into English by L. Schweng), London, 1938.

income, viz. personal remittances received from abroad and net dividends and interest received from abroad (actually a negative item), were in the prewar period included in the real income without any revision for changes in the price level.

In *Norway*[1] real national income has been estimated by deflating the net value added for each branch of industry. For agriculture the gross value of the output has been deflated by expressing all quantities in prices of the base year (1939). Output in the form of improvements of new land and construction of agricultural buildings (positive items), and depreciation allowances for buildings and machinery (a negative item), have been deflated by an index of prices of agricultural property; all other output and costs in agriculture by the index of wholesale prices. For manufacturing and handicrafts the index of industrial production has been used to measure the changes in real income since the base year. For building activity the index of employment has been used without regard to the decrease in productivity of labour during the war years. Income from shipping earned in foreign exchange, and similar income from other services rendered to foreign countries, have been deflated by an index of import prices, on the ground that such returns may be used to finance imports. However, net dividends and interest payable abroad were deflated by an index of wholesale prices.

Income in retail trade has been deflated by an index of retail prices, and income in wholesale trade by an index of wholesale prices.

Income in banking and insurance has been deflated by the index of cost of living, assuming that wages and salaries have fluctuated parallel to this index and that the productivity of labour remained unchanged.

Income of hotels, restaurants, etc., has been deflated by the index of cost of living.

Rental income has been deflated by the index of rents. The net value added of government services outside government enterprises is measured by the total payroll, which was deflated by an index of wage and salary rates. For other services the index of cost of living has been used.

For *Palestine*[2] the output of the exports industries has been

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[1] *Nasjonalinntekten i Norge 1935–1943*, Central Bureau of Statistics, Oslo, 1946.

[2] P. J. Loftus, *National Income of Palestine 1945*, Jerusalem, 1948.

adjusted taking into account changes in the terms of trade of the country. Therefore the value figures for the exports industries were deflated by the index of import unit values instead of by an index of prices of goods exported. For all other industries the net value added figures were deflated by an index of wholesale prices.

The following preliminary conclusions seem to follow from the above survey of methods used in various countries to approach real national income from the output side:

1. Output of individual branches of industry is usually measured on the basis of indices of production. Sometimes net value added or other value figures, deflated by a price index, have been used, assuming that the figures thus obtained represent indices of the volume of the output.[1]

2. For the government non-business sector, education, personal services, and sometimes also for other branches of industry, employment is taken as an index of the volume of output, changes in productivity thus being neglected.

3. Statistical practices with respect to the deflation of the export surplus, of net income from investments abroad, and other items of the international balance of payments differ widely. There is no generally adopted principle for the treatment of these items.

4. The net values added of the various branches of industry in the base period are usually adopted as weighting coefficients, but sometimes other value figures are used to combine the indices of output for separate branches of industry into the index of real national income.

5. The classifications used include industries producing intermediate products and industries producing final goods. When indices of output for both groups of industries are incorporated into the index of real national income, technical progress as

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[1] This assumption is, in general, not fulfilled. Net value added per unit of output fluctuates because the prices of the products and of the raw materials used up fluctuate, and because the quantity of raw materials used up per unit of output may change owing to technological progress and other factors. There is thus no simple price index to deflate a series of net values added. Another method would consist in deflating the value of the output by an index of the prices of the commodities produced, and to subtract the values of the raw materials used up deflated by an index of the prices of those materials. It can easily be seen that the method would thus be identical to the method by which the values of all final goods and services entering into the national expenditure are deflated and added up, and the value of imports, deflated by an index of import prices, is deducted.

reflected in a decreased use of raw materials and semi-manu-
factured products per unit of output of final goods may not
be duly taken into account.

V. THE VALUATION OF NATIONAL INCOME

In this section the concept of real national income will be
investigated in greater detail. Such an enquiry is believed to be
necessary in the interest of obtaining a theoretical basis for the
measurement of real national income. In the next section rules
will be suggested for the statistical evaluation of real national
income with a view to promoting international comparability
in this field.

Recent discussions on the valuation of social income[1] have
necessarily a bearing also on the problems involved in the
measurement of real income. They center on the problem of
whether national income should be interpreted as a measure of
social welfare or as a measure of productivity, and what the
basis of the valuation should be in either case. It is now agreed
that if national income is conceived of as a measure of social
welfare, it should not be limited to consumers' goods alone.
The net additions to the stock of capital goods are to be in-
cluded, and they should be valued on the basis of the discounted
yields in terms of finished goods. Statisticians usually assume
that this relationship is reflected by actual market prices.

The results of governmental activities, outside the sphere of
public utilities, are not so easy to handle. Since in general there
exist no market prices for the services provided by government,
they are usually valued at what they cost. Differences of statis-
tical treatment result from differences in the interpretation of
the nature of the public services. In many estimates of national
income the government is not considered as a producer, but as
the final buyer of goods and services provided on behalf of the
community.[2] Consequently, in the national expenditure account

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[1] S. Kuznets, 'On the Valuation of Social Income', *Economica*, February 1948,
pp. 1–16; May 1948, pp. 116–31.

J. R. Hicks, 'The Valuation of the Social Income: A Comment on Professor
Kuznets' Reflections', *Economica*, August 1948, pp. 163–72.

[2] This is also the point of view adopted by the Subcommittee on National
Income Statistics of the League of Nations Committee of Statistical Experts.
Cf. *Measurement of National Income and the Construction of Social Accounts*,
Studies and Reports on Statistical Methods, No. 7, United Nations, Geneva,
1947.

all public current expenditure on goods and services appears as outlay on final goods and services. According to the other approach, which has been defended by Professor Kuznets, a distinction is made between government outlay on intermediate goods and services and government outlay on final goods and services. In the national expenditure account only the latter appears as a separate item, since the former is already included in the value of all other final goods and services sold on the market. The numerical discrepancy between the two methods is usually very considerable. According to the first method the social income equals: all private incomes plus indirect taxes less subsidies less government transfer payments (pensions, interest on war debts, etc.). According to the second method and following Professor Kuznets, the social income equals all private incomes less direct taxes plus all final public services at cost.

The total obtained according to the first method equals what is usually termed the national income at market prices. It is worthwhile to note that the second method does *not* lead to what is commonly called the national income at factor cost.

If the national income is conceived of as a measure of the aggregate welfare enjoyed by a nation to the extent that this is determined by the output of economic goods and services, then the second method seems to offer the appropriate approach to this concept. However, it requires the solution of the difficult problem of developing criteria for distinguishing between government intermediate and government final services. For a broad group of government activities it may not be too difficult to establish criteria acceptable to statisticians, but the difficulty is that there remains a large area where any decision is necessarily arbitrary. Experience shows that in those countries where the method has been used the conventions adopted differ widely. The problem of allocation is also difficult, because it presents itself every year and thus requires new decisions to be made when the government assumes new forms of responsibility. The procedures adopted affect not only the level, but also the fluctuations of the national income totals obtained.

The other point deals with the controversy over social income as a welfare concept and as a measure of the productivity of the economy. Professor Hicks has set forth that the two concepts do not necessarily lead to the same statistical totals, but according to Professor Kuznets the two must necessarily be equal. The

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reason for this identity is in principle very simple: There is no other criterion for productivity than the satisfaction derived by final consumers. Following the usual way of reasoning the marginal productivity of the factors of production must equal their supply price, which, as Professor Kuznets has remarked, equals the payments to factors, excluding direct taxes, but including whatever final services may be provided free by public agencies. Thus national income as a measure of productivity equals all private incomes less direct taxes plus government final services, which equals the total for national income as a measure of social welfare. Professor Hicks, on the contrary, claims that the welfare measure and the productivity measure may be different and even that the productivity measure is not unique. This he explains by criticizing Professor Kuznets' thesis that the supply price of factors of production is determined by payments excluding direct taxes but including government final services rendered free and transfers. The main argument is that there are 'indivisible' or 'unallocable' final services which cannot be considered as part of the supply price of factors.

Whatever the outcome of the theoretical discussion may be, experience shows that for all practical purposes statisticians prefer to compute either national income at market prices or the factor cost concept, or both.

Great also is the weight of practical considerations if national income must be evaluated in constant prices. The attempt to adhere strictly to the view that national income as a measure of welfare must be equal to national income as a measure of productivity would eliminate certain series which are considered useful for purposes of economic analysis.

Summarizing recent developments it may be stated that at least two different approaches to the concept of national income in constant prices may be distinguished, which do not necessarily have to lead to identical results.

According to the first method national income expressed in constant prices is regarded as an index of production extended to cover all output of goods and services in the economy. In its simplest form the index is built up out of separate indices for the various branches of economic activity, combined into a general index using the net values added in the base period as weighting coefficients. In this form the method may be used to measure short-term fluctuations in real national income. For

the measurement of fluctuations over a longer period the method cannot be very accurate, since in general it does not sufficiently take into account structural changes which may result, for example, in a smaller volume of raw materials or semi-finished products being required per unit of final output, or a larger volume of transportation services being needed to produce the same quantity of final output. This deficiency in the method may be remedied, however, by replacing the indices of production for separate branches of economic activity by the figures that are obtained if for each industry the value of its output and the value of the materials used up in the productive process are deflated by suitable price index numbers, and the latter series subtracted from the former. Since for each intermediate industry the value of its output would cancel against the value of the materials used up in the next higher industry (apart from changes in business inventories), the result is the same as if only all output of final goods and services had been deflated.

The method is thus almost identical to the result obtained if the components of national expenditure, i.e. consumers' expenditure on goods and services, and public and private capital formation are expressed in constant prices. The procedure would not eliminate all conceptual difficulties. Deflating government current expenditure on goods and services by an index of prices leaves still unsolved the problem of the distinction between government intermediate and final services. If, as is often done, estimates of national income in constant prices are used for intertemporal comparisons of welfare, then it is essential that government intermediate services be eliminated, since otherwise the results obtained may easily not agree with the general consensus concerning changes in welfare in the country concerned.

So far the discussion in Section V has been limited to the case of a closed economy. In the case of an open economy the problem arises of how to deflate the net foreign investment component in the national expenditure account.[1] If national income in constant prices is conceived of as the national product expressed in constant prices, then it seems appropriate to deflate

[1] In the national expenditure account unilateral transactions such as aid received from abroad are often treated like other imports. If this is done the account shows the export surplus of goods and services as a separate component instead of net foreign investment. This does not in principle make any difference for the problem of deflation discussed here.

exports by an index of export prices and imports by an index of import prices. If, however, real national income is approached entirely from the expenditure side, then it seems more appropriate to consider exports as a means for paying for present or future imports, and in the expenditure account they should, therefore, be deflated by an index of import prices. A similar reasoning may be applied to the 'invisible' items in the balance of payments.

VI. PROPOSALS FOR THE MEASUREMENT OF REAL NATIONAL INCOME

A satisfactory solution of the problem of how to express national income in constant prices cannot easily be established. For practical purposes two methods are available. Estimates of real national income may be obtained by combining indices of production for all branches of economic activity, subject, if necessary, to further refinements, or they may be obtained by expressing the various components of national expenditure in constant prices. Which method is the most promising for practical purposes depends on the nature of available statistics. It is often felt that the first method is more useful for practical purposes, since in general more statistics are available on the volume of production in various industries than on final outlay on goods and services. In the opinion of the author attempts to approach the real national income from the expenditure side should, where possible, be made, since they are most useful for purposes of economic analysis and very informative as to the exact meaning of the figures.

The methods actually used for expressing the components of national expenditure in constant prices have often to be considered as a compromise, and it is unavoidable that the techniques applied for the various components are not consistent.[1] For practical purposes the following rules may be adopted:

(*a*) Consumers' expenditure on goods and services may be expressed in constant prices by expressing all quantities concerned in values of the chosen base period. Sometimes, and particularly if important changes in the structural pattern of

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[1] This logical inconsistency of our methods also explains why it is impossible to deflate all the items in the social accounts and still arrive at accounts which balance. This conditions would be fulfilled if our methods for deflating obeyed theoretical criteria strictly.

consumers' expenditure have occurred, it may be necessary to use more complicated formulae.

(b) Government current expenditure on goods and services may be deflated as follows: For total wages and salaries of government personnel an index of salary rates may be used, and if possible an attempt should also be made to allow for changes in labor productivity. For government outlay on commodities a special price index should, if possible, be constructed.

(c) Gross and net domestic capital formation may be deflated using a suitable price index, or by expressing all quantities in prices of the chosen base period. Special methods may have to be used to express public capital formation in constant prices.

(d) Net foreign investment, whether positive or negative, may be deflated by an index of import prices, because it is the return in goods and services received from abroad that measures the contribution to social welfare. For certain purposes it may be desirable to measure the volume of output for exports irrespective of the return in goods received from abroad. Total exports of goods and services may then have to be deflated by an index of export prices. However, net interest and dividends and other income received from abroad – whether positive or negative – should probably always be deflated by an index of import prices.

A discussion of the conceptual problems that arise in defining the various components of the national expenditure is beyond the scope of this paper. For those problems reference is made to the existing literature.[1] Imputed items of income and expenditure such as farmers' consumption of own produce and imputed banking services rendered free, the problems arising in defining and measuring capital formation and government current expenditure on goods and services, and many other problems have a bearing also on the methods used for measuring national income in constant prices.

A few words may finally be said about the reliability of the estimates obtained. Certain countries (Ireland, Sweden, the Netherlands) have adopted the practice of classifying the estimates of the components of national income into groups, indicating their probable margins of error. A similar practice may

[1] (a) Cf. Report of the Subcommittee on National Income Statistics of the League of Nations Committee of Statistical Experts.
(b) *National Income Statistics of Various Countries 1938–1947*, Statistical Office of the United Nations, January 1949.

be used also when estimates of real national income are compiled. The problem is more complicated in this particular field, since the margins of error of the series obtained are effected also by the adequacy of the price indices used as deflators or other procedures used. In addition there is the conceptual problem that in presenting figures on real income the problem of the distinction between government intermediate and final services cannot be disregarded. The best practical recommendation in this case seems to be that adequate qualifications should be attached to the figures as a warning against possible misinterpretation of the series.

TABLE 1

National Income at Market Prices as Per Cent of National Income at Factor Cost

	1938	1946	1947	1948
Australia[1] [in mill. of £ (A)]:				
1. Domestic national income at market prices	904	1,534	1,807	..
2. Domestic national income at factor cost	814	1,359	1,635	..
3. 1. as per cent of 2. . . .	110.6	112.9	110.5	..
Belgium [in mill. of francs]:				
1. National income at market prices .	69,560	209,600	241,230	253,090
2. National income at factor cost .	64,000	198,400	225,950	235,300
3. 1. as per cent of 2. .	108.7	105.6	106.8	107.6
Canada [in mill. of $ (C)]: . .				
1. National income at market prices .	4,623	11,026	12,589	14,517
2. National income at factor cost .	3,986	9,765	10,989	12,796
3. 1. as per cent of 2. . . .	116.0	112.9	114.6	113.4
Denmark:				
1. Domestic national income at market prices	6,822	14,379	15,612	16,956
2. Domestic national income at factor cost	6,460	13,349	14,585	15,776
3. 1. as per cent of 2. . . .	105.6	107.7	107.0	107.5
New Zealand[2] [in mill. of £ (NZ)]:				
1. National income at market prices .	211.3	406.1	460.0	..
2. National income at factor cost .	193.0	378.0	422.0	..
3. 1. as per cent of 2. . . .	109.5	107.4	109.0	..
Norway[3] [in mill. of kroner]:				
1. National income at market prices .	3,976	7,860	8,983	9,542
2. National income at factor cost .	3,741	6,992	8,143	8,750
3. 1. as per cent of 2. . . .	106.3	112.4	110.3	109.1
United Kingdom [in mill. of £]:				
1. National income at market prices .	5,281	9,417	10,194	11,325
2. National income at factor cost .	4,640	8,111	8,725	9,675
3. 1. as per cent of 2. . . .	113.8	116.1	116.8	117.1
United States[4] [in mill. of US $]:				
1. National income at market prices .	76,691	197,440	218,337	240,400
2. National income at factor cost .	67,375	179,289	202,500	224,400
3. 1. as per cent of 2. . . .	113.8	110.1	107.8	107.1

Notes:
[1] Fiscal years starting 1st July.
[2] Fiscal years starting 1st April.
[3] Housewives excluded.
[4] The difference between national income at market prices and national income at factor cost is equal to indirect taxes less subsidies minus current surplus of government enterprises plus business transfer payments plus the statistical discrepancy. It is not possible to indicate which part of this statistical discrepancy, which amounted to respectively −91, 979, −3,389 and −4,400 million dollars, should be allocated to each of the income totals.

Sources:

Australia. *National Income and Expenditure, 1947–1948*, p. 8.

Belgium. Estimates by F. Baudhuin.

Canada. *National Accounts, Income and Expenditure, 1938–1947*, p. 16 for years 1938–46. *National Accounts, Income and Expenditure, 1947–1948*, revised, p. 2 for years 1947–48.

Denmark. *Statistisk Aarbog, 1948*, Table 242 for years 1938 and 1946. *Danmarks Nationalbudget, 1949*, pp. 90 and 99 for years 1947–48.

New Zealand. *Official Estimates of National Income, 1938–39 to 1947–48*, Supplement to June 1948 issue of *Monthly Abstract of Statistics*, p. 3.

Norway. *Nasjonalbudsjettet, 1948*, pp. 5 and 6 for the year 1938. *Nasjonalbudsjettet, 1949*, pp. 108 and 133 for the years 1946–48.

United Kingdom. *National Income and Expenditure of the United Kingdom, 1946–1948*, p. 3.

United States. *Survey of Current Business*, July 1948, p. 16 for the years 1938–47. *Survey of Current Business*, February 1949, p. 10.

Note on the definitions of indirect taxes and subsidies:

Australia. Indirect taxes: Includes payroll tax, lottery taxes, war damage insurance premiums, employers' contributions to Queensland Unemployment Insurance Fund. Excludes real estate taxes. Subsidies: Includes capital subsidies.

New Zealand. Indirect taxes: Excludes real estate tax. Subsidies: Excludes capital subsidies.

Norway. Indirect taxes: Includes fees paid by business enterprises, excludes real estate taxes. Subsidies: Excludes capital subsidies.

United Kingdom. Indirect taxes· Includes employers' contributions to social insurance. Export duties are included in natonal income at factor cost. Subsidies: Includes capital subsidies.

United States. Indirect taxes: Includes surplus of government enterprises. Subsidies: Includes deficit of government enterprises.

TABLE 2

Estimates of National Income in Current and in Constant Prices[1]

	Argentine[2]		Austria[3]	Bulgaria[4]	
	Current prices	1935 prices	1937 prices	Current prices	1939 prices
	Million pesos		Million schillings	1,000 million leva	
1938 .	8,857	8,070	6,000	..	..
1939 .	9,294	8,630	..	56.9	56.9
1940 .	9,424	8,620	..	67.1	53.4
1941 .	10,458	9,490	..	89.4	57.9
1942 .	11,914	9,730	..	121.8	56.7
1943 .	12,718	9,680	..	161.5	53.4
1944 .	14,295	10,300	..	250.0	49.3
1945 .	15,055	10,000	..	285.8	45.4
1946 .	..	..	3,000	334.0	50.1

	Denmark[5], [6]		France[7]		Greece[8]	
	Current prices	1935 prices	Current prices	1938 prices	Current prices	1938–39 prices
	Million kroner		1,000 million francs		1,000 mill. drachmas	
1938 .	6,722	6,180	403	403	61.3	61.3
1939 .	7,325	6,529	..	..	63.8	63.8
1940 .	7,869	5,968	..	..	..	..
1941 .	8,858	5,347	..	..	..	..
1942 .	9,935	5,458	..	..	..	..
1943 .	11,212	6,033	..	..	..	..
1944 .	12,543	6,606	..	..	..	..
1945 .	12,398	6,087	..	..	..	..
1946 .	14,329	6,700	2,718	333	5,940	34.9
1947 .	15,612	..	3,704	360	7,342	39.5
1948 .	16,956	..	5,886	393	..	..

[1] Figures relate to national income at factor cost unless otherwise stated.

[2] Gross national product at market prices. Source: *La Renta Nacional de la Republica Argentina*, Banco Central, Buenos Aires, 1946.

[3] Source: *Monatsbericht des Oesterreichischen Institutes fuer Wirtschaftsforschung*, 15th May 1947. Figure for 1938 refers to 1937.

[4] Source: *Bulletin Mensuel de la Direction Générale de la Statistique*, No. 2–3, 1947, p. 57.

[5] Sources: 1938–46: *Statistisk Aarbog, 1948*, Tables 241 and 242; 1947–48: *Danmarks Nationalbudget for Aaret 1949*, p. 99.

[6] National income at market prices.

[7] Gross national product at market prices, excluding the government sector. Source: Commissariat Général du Plan.

[8] Unofficial estimates.

	Hungary[1, 2]		Italy[4]	Norway[1, 5]		Palestine[8]	
	Current prices	1938–39 prices	1938 prices	Current prices	1939 prices	Current prices	1939 prices
	Million pengos		1,000 mill. lire	Million kroner		Million £ (P)	
1938 .	5,192	5,192	116.6	4,509	4,669	..	..
1939 .	5,940	5,506	..	4,895	4,895	30.2	30.2
1940 .	6,743	5,312	..	5,138[6]	4,301[6]	..	..
1941 .	8,311	5,171	..	6,563	4,434	..	..
1942 .	10,348	5,467	..	6,567	4,248	75.9	..
1943 .	15,431	5,214	..	6,677	4,121	90.0	..
1944 .	..	..	82.9	6,400	4,000	123.0	..
1945 .	..	2,541	68.4	6,100	3,800	141.9	44.7
1946 .	11,816[3]	3,137	..	7,860[7]	..	..	..
1947 .	..	..	81.2	8,983	..	..	..
1948 .	..	..	..	9,542	..	..	..

	Philippines[1, 9]		Switzerland[10]		Turkey[1, 11]	
	Current prices	1938 prices	Current prices	1938 prices	Current prices	1947 prices
	Million pesos		Million francs		Million £(T)	
1938 .	994	994	9,046	8,314	..	..
1939 .	..	..	9,225	8,409	..	..
1940 .	..	..	9,678	8,028	..	..
1941 .	..	..	10,634	7,198	..	..
1942 .	..	..	11,523	7,176	..	..
1943 .	..	..	12,381	7,409	5,500	6,000
1944 .	..	..	12,824	7,378	..	..
1945 .	..	..	13,824	7,939	5,740	5,800
1946 .	2,759	863	15,658	8,806	..	..
1947 .	..	..	17,413	9,689	..	..

[1] National income at market prices.

[2] Figures relate to twelve months beginning 1st July of year stated. Source: *Economic Statistical Bulletin*, Budapest, May 1947.

[3] In million forints. Source: Hungarian Institute for Economic Research.

[4] Sources: *Congiúnctúra Economica*, March 1946, and Banca Nazionale del Lavoro, *Quarterly Review*, No. 4, January 1948, pp. 260–63.

[5] Sources: 1938–39: *Nasjonalbudsjettet, 1948*, p. 6; 1940–45: *Om nasjonalbudsjettet, 1947*, p. 89; 1946–48: *Nasjonalbudsjettet, 1949*, p. 108.

[6] Figures for 1940–45 excluding customs duties. Estimates for 1944 and 1945 very rough.

[7] Excludes unpaid services of housewives, which are included in the figures for previous years.

[8] P. J. Loftus, *National Income of Palestine, 1944*; idem *1945*, p. 17.

[9] Source: *Report and Recommendations of the Joint Philippine-American Finance Commission*, Manila, 1947.

[10] Source: *Das Volkseinkommen der Schweiz, 1938–1947*, Bern, 1948, p. 18. Figures in 1938 prices are based on national income at market prices less direct taxes.

[11] Source: Sefik Bilkur, *National Income of Turkey*, Ankara, 1949, p. 40.