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A SYSTEM OF PRICE AND QUANTITY INDEXES FOR NATIONAL ACCOUNTS

(Memorandum by the Secretary-General)

1. At its ninth session the Statistical Commission requested the Secretary-General:

- (i) To continue to collect information from the Governments of Member States on statistics of national product and expenditure in constant prices, as well as on the methods of estimation used;
- (ii) To assist countries in the preparation of estimates of national product and expenditure in constant prices;
- (iii) (a) To circulate a technical report on price and quantity indexes in national accounting to the Governments of Member States and interested international organizations for their comment;
- (b) Subsequently, to prepare a more conclusive report on the subject with the assistance of experts, taking account of the comments received from the Governments of Member States and international organizations;
- (c) To submit a report to the Statistical Commission at its tenth session.

2. The Statistical Office has collected official statistics of real product and expenditure and related price index data from Governments of Member States on a regular basis. The product and expenditure estimates have been published periodically in detail in the document Statistics of National Income and Expenditure (Statistical Papers, Series H), and in partial and abridged form

in the Statistical Yearbook. In addition, continuing study has been made and information sought concerning the concepts and methods used by countries in preparing systems of price and quantity indexes within an accounting framework.

3. A technical report on a system of price and quantity indexes for national accounts (E/CN.3/L.46), which examines questions of both concept and method, has recently been distributed to Governments of Member States and interested international organizations for their comment. In distributing this report, countries were asked to accept its subject matter as a basis for the detailed technical discussion of any aspects of this subject which were of interest to them. The comments received from countries will provide the material for detailed revision of the report, looking towards the publication of an interim technical study on this subject.

4. The report recently distributed is tentative and exploratory in character. In dealing with the form and concepts of price and quantity indexes, it describes a system of indexes drawn up within an abridged framework derived from the system of accounts in current money terms given in the United Nations report, A System of National Accounts and Supporting Tables, (Studies in Methods, Series F, No. 2, New York 1953), hereafter referred to as SNA. The description of methods given in the report is based largely upon the methods used in official country statistics; where permitted by available experience an attempt was made to draw conclusions regarding the usefulness of particular methods of estimation. But further detailed enquiry into the effectiveness of some of the methods now in use, including detailed testing by reference to a wide range of data, seems urgently necessary.

5. The following pages contain a summary of and commentary upon those aspects of the technical report which may be of particular interest to the Statistical Commission.

#### Case for factorization

6. It seems important briefly to restate the case for factorization of current value into its components price and quantity, since some experienced experts in this field have been so influenced by the formidable statistical difficulties as to doubt whether, in certain sections of the accounts, the concept of factorization is valid at all. It must be admitted that some items cannot be

unambiguously dealt with, for instance employee compensation which can be deflated by a wage index or a consumer price index: a way for dealing with this particular case is suggested in Chapter 2 of the technical report. And there are certain items (transfers and the like) in which, in the present stage of thought in these matters, the concepts of "price" and "quantity" have little meaning.

7. Probably the main reason why, for many years, several countries have expressed such major flows as imports, exports, industrial or agricultural production and consumption in constant price terms is to show in each case the extent to which changes in current value are due to changes in prices and changes in quantity respectively. Cause-effect relationships are notoriously difficult to establish in dealing with economic variables: it is therefore not unimportant that in many cases one can unambiguously state that the cause of a given percentage change in value was due in stated degree to price and quantum movements respectively. Consumption at constant prices is relevant to the study of welfare, particularly so in the case of under-developed countries and volume of production, in conjunction with labour input and other items in constant price terms, is related to productivity. In primitive societies, in which the market economy is comparatively unimportant and prices consequently of doubtful applicability to total (including subsistence) output, it might even be argued that the quantum concept is the only valid one.

#### Form of accounts for factorization purposes

8. As will be clear from Chapter 2 of the technical report the viewpoint taken is that the price and quantity indexes in the system should be related as closely as possible, as regards items and form of presentation, to the SNA, modifications being dictated solely by considerations of statistical expediency. For each item in the system one aspires therefore to have three elements juxtaposed: (a) price indexes; (b) quantity indexes (or absolute values in constant price); (c) current value indexes or absolute values. Juxtaposition seems desirable so that the reason for the value change of each item over a period may be seen at a glance. The three-fold system should be presented in the form of an abridged set of accounts similar to those of SNA (whether these accounts are made to balance or not). Such a form of presentation will "explain" value changes in the large aggregates (gross domestic product and the like) in terms of price and quantity trends, and in turn, the aggregates are explained by the movements in their constituent elements.

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9. Among the modifications of SNA which seem desirable from the viewpoint of factorization of their elements into price and quantity, the most important is the consolidation of the three Capital Reconciliation Accounts (4, 5 and 6) with Account 3 (Domestic Capital Formation) whereby all capital transfers and intersectoral borrowing items (in regard to which the concepts of "price" and "quantity" are, to say the least, debatable) disappear. There might also be a consolidation into a single item (savings / provisions for consumption of fixed capital) of all items on the right side of the resulting domestic capital formation account which describe the financing of capital formation. If required, this single real financial item will in fact be defined as the sum of gross domestic capital formation plus increases in stocks plus external trade surplus, all three being directly estimated at fixed prices.<sup>1/</sup>

Items for analysis in real terms

10. Just as SNA has served as a guide to the major items in the accounts which qualify for deflation, so the analysis in real terms of these items should be on the lines of the Supporting Tables. These tables are twelve in number but it is suggested that, at the present stage in the evolution of real national accounts and the concomitant price index system, attention should be confined to selected items in six of the tables only:

Table 1 (I)	Expenditure on gross national product
Table 2 (II)	Industrial origin of gross domestic product at factor cost
Table 3 (VI)	Composition of gross domestic capital formation
Table 4 (VIII)	Composition of private consumption expenditure
Table 5 (X)	Composition of general government consumption expenditure
Table 6 (XI)	External transactions

The cross references (in large Roman numerals) relate to the corresponding SNA Supporting Tables. Tables in the latter series suggested for omission are as follows:

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<sup>1/</sup> Cf. fifth equation of (7) in paragraph 18 of Chapter 2 of the technical report.

Table III.	National income by type of organization (private enterprises, public corporations etc.)
Table IV.	Distribution of national income (compensation of employees etc.)
Table V.	The finance of gross domestic capital formation (saving, consumption of fixed capital, deficit of the nation)
Table VII.	Receipts and expenditure of households (appropriation account of households)
Table IX.	General government revenue and expenditure (income from property, taxes, consumption expenditure, subsidies, saving, transfers)
Table XII.	Receipts and disbursements of the rural sector.

Some or all the items in these latter tables may ultimately qualify for inclusion in the price-quantity series, but the time is not yet, except perhaps for Table XII. Most of the tables omitted relate to financial transactions, thus emphasizing the conceptual (to say nothing of the practical) difficulty of price-quantity factorization of such items, other than on conventional lines. Countries in a position to do so might well consider including the items in Table XII (having perhaps redefined it to include only agriculture, forestry, fishing) in their price-quantity series, even if it is found desirable to exclude the financial flows 5, 6, 11, 12. The rural sector is large and well-defined in all countries; it has characteristic features, in particular that non-marketed production is a large part of total production in most countries; and the members of the agricultural sector in particular share a common economic outlook. If price, quantity and value are available for the rural items specified it will be possible to set up the system for the complementary urban part of the economy. Thus price, quantity and value would be available for the three main sectors, rural, urban and external.

11. As regards the "included" tables, it will be observed that all items except those in Table 2 are gross flows, so that no theoretical problem arises with regard to price-quantity factorization. In the case of Table 2 it will be necessary, in principle, to have recourse to the double deflation method. If the method be applied consistently - i.e. if in the case of goods and services sold by one sector to another the same price deflator is used, as it should be - then intermediate flows will cancel on summation to give gross domestic product as production of final goods less imports in real terms.

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12. For all tables except Table 2, it is suggested that the three elements (i) current value (ii) value at fixed prices and (iii) the price index number should be juxtaposed. In cases where they are significant the current value and value at fixed prices of the imputed constituent should be shown separately. For Table 2, the three elements might be shown for output, input, and added value, with the imputed item for home consumption of own produce distinguished in the case of agriculture. If the added value in the imputed constituent of agricultural output is not available its estimation, for this purpose, should not be specially difficult if the gross output value is known. The computation of price index numbers for inputs for items in Table 2 as well as the output price index for agriculture, hunting, forestry and fishing would give a liberal representation to raw and semi-manufactured commodities which, except to the extent to which they may be exported, are absent from the major flows such as production of final goods.

13. Table 2 is a large consolidation of the items in Table II of SNA. Countries wishing to do so can, of course, factorize any of the subsidiary flows in Table II, for example for the food industry and the machinery industry.

#### Balancing of real accounts

14. The view that the technical report is largely experimental (except in so far as it describes country practices) applies with special force to its Chapter 2 which deals with the balancing of accounts in constant price terms. The object of this chapter is to make a fairly detailed case for a re-examination of the problem of producing a balancing set of accounts with as close regard as possible to the form and content of SNA. Though a fairly positive attitude is taken in the chapter it is intended merely as a basis for discussion. It is tentatively suggested that, in the form of accounts (6) in paragraph 17 of Chapter 2, which imply a large consolidation of SNA, a balancing system in real terms is conceivable. This renders necessary the introduction of an element which is zero in the accounts in current terms, namely the import (or export) trading gain which has to be introduced into the external account to make it balance in real terms - compare the fourth equation (or account) in real terms in paragraph 18 with the fourth equation in current terms in paragraph 17.

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Since the accounts in real terms, like the accounts in current values, are compiled on the double-entry principle, a place has to be found in another account for the gains term. A case is made in the technical report for its inclusion in the second account, which defines the national product. If this treatment be accepted the current value relationship:

$$\text{National product} = \text{domestic product plus net external factor income}$$

no longer applies in constant price terms when it is necessary to introduce on the right hand side the trading gain (positive or negative). Domestic product in constant prices, on the other hand, has item for item, the same form as the corresponding (consolidated) account in current values. This definition of domestic product has the convenient additive property that if real factor income in each economic sector (or even in each productive unit) is computed by the double deflation method (see para. 25 below) the sum of real factor incomes equals the real domestic product as defined. Real domestic product may be found more suitable than real national product in connexion with productivity studies, since it is unaffected by fortuitous divergencies in the trends of import and export prices which give rise to the gain from the terms of trade component.

15. Even more tentative is the suggested treatment of external factor income payments and factor shares (employee remuneration, profits etc.). Certain advantages are found in deflating employee compensation by both an earnings and a consumers' price index to give labour input and labour reward respectively, displaying in the appropriate account input and what is termed "increment", or the difference between reward and input. It has to be re-emphasized here that the proposed labour input measure is expressed in conventional units of "man-hours", without regard to such considerations as changes in labour effort, capital resources, or other conditions which affect labour productivity. Detailed productivity studies, of a character referred to briefly in Chapter 2 of the technical report would be needed to provide the material for a comprehensive analysis of the relationships between changes in the productivity of factors and in their real remuneration.

16. Amongst the advantages of having a system of real balancing accounts are the following:

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- (i) the principal aggregates like gross domestic product, national income and capital formation will appear in consistent relationship to one another;
- (ii) items like real national income, real savings which, considered in isolation, pose a formidable (perhaps an insoluble) deflation problem have their real value defined by the accounts (regarded as equations) in terms of unambiguously deflatable items like imports, exports, production and consumption;
- (iii) the current value, price index and quantum for each item can be brought into consistent relationship with one another through the fact that the real accounts balance.

The institution of a system of real balancing accounts is therefore worth considerable effort, even if some of the items must for statistical reasons be deflated by rather arbitrary methods. It is suggested that most of these items will be comparatively small and if their deflated values are of dubious validity in themselves those values could be concealed in larger aggregates.

#### Real trading gain

17. Considerable attention is devoted in the technical report to this important concept, which is now widely accepted by countries and international bodies. The relevant item is defined from the following considerations. Ignoring external factor income (which is relatively small for most countries and may possibly require to be treated in a somewhat conventional way), the external account in current values is:

$$E = M / N$$

where E, M and N are the current values of exports, imports and surplus respectively, and which is the fourth account in system (6) in paragraph 17 of Chapter 2 of the report, with primed letters being used to indicate the corresponding fixed price value. Of course a real account could be made by defining N' as the difference between E' and M' which can be unambiguously computed. But such a definition could have anomalous results if N had a different sign (/ or -) from N'. If N is positive for example it is certain that the country has acquired a tangible asset (or achieved a reduction of debt) which,

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however it be defined in real terms, could not be negative. To overcome this difficulty, the surplus is regarded as a distinct entity and deflated in one way or another to give  $N'$ . Then, to balance the external account a new term  $T'$  is introduced, defined therefore by the fourth equation of system (7) of paragraph 18 of Chapter 2.  $T'$  is the real trading gain.

18. For the deflation of the system of accounts in the highly consolidated form of (6) in paragraph 17 of Chapter 2 - in which, furthermore, net external factor income has been assumed to be zero - the only difficulty which is likely to arise is in connexion with the deflation of the surplus  $N$ . As shown in the text of the technical report, different authorities take different views as to which deflating price index is appropriate. The method favoured in the report is that when the surplus is positive (i.e. when current exports value exceed current import value) it should be deflated by the export price index, and when the surplus is negative by the import price index. This method has the merit of consistency as between two countries in the sense that the resulting gain (loss) from the terms of trade of one country will equal the loss (gain) of the other, which may appear a desirable property. On this approach the gain has the interesting form of the difference between imports deflated by (i) the import price index and (ii) the export price index, vanishing, therefore, when these indexes are the same. Furthermore, the term in this form is much more influenced by the relative movements of import and export prices than by the relatively constant value of imports; the real surplus  $N'$ , on the other hand, is more strongly influenced by the current trade gap. These properties indicate the different characters of the two terms. The essentially quantum character, in the sense of being valued at base year prices, of the trading gain term should be emphasized. It is therefore not to be confused with the term expressing the effect due to price changes (as distinct from volume changes) in the change in value of the trade surplus between base and current period.

#### Gross or net concepts

19. Even for current value accounts the estimation of capital consumption poses formidable (some authorities would say "insurmountable") statistical problems. Accordingly, at least until substantial progress has been made towards their solution, it would seem inexpedient to attempt to try to estimate real net

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national product at factor cost. In other words Account 2 (national income) should be presented gross, i.e. before making provision for consumption of fixed capital.

#### Factor costs versus market prices

20. There is no conceptual problem in dealing with indirect taxes and subsidies in real terms if the double (or multiple) deflation method be adopted for the computation of product at factor cost and the other major entities in the accounts. The definition (as regards inclusion or exclusion of taxes and subsidies) of each relevant item in SNA in constant prices is the same as that in current values. To apply the method, current value flows are to be deflated by price index numbers in which the price per unit of the commodity or service has the same content as the corresponding value; i.e., in the flow, value is gross of indirect tax and net of subsidies, the concomitant price must be likewise. Constant price items at factor cost will be derived from the value of the item at base year market price by adding subsidies and deducting indirect taxes both at base year rates. No inconsistency can then appear as regards reconciliation of aggregate factor income on the one hand and the sum of the final expenditure flow of private consumption expenditure, general government expenditure etc. on the other.

#### Real values of indirect taxes and subsidies

21. In so far as indirect taxes and subsidies are specific to stated units of goods and services, they can be regarded as "prices" and price index numbers suitable for deflating the current values of the respective items derived from them. If they are general the only course possible seems to be to distribute them arbitrarily amongst the relevant schedule of goods and services and then proceed as if they were specific.

#### Formula and base period

22. In connexion with price and quantum index number making, a disproportionate amount of attention has been given to these aspects which are unimportant compared to e.g. the practical problem of obtaining a comprehensive price series and the practical and theoretical problem of how to deal with quality changes. Countries have prejudices in favour of one or another of the well-known formulae and not much has emerged from all the vast literature on the subject to

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establish one as preferable to any other except on grounds of convenience for calculation which gives Laspeyres the lead. If possible both the Laspeyres and Paasche indexes should be calculated at intervals: significant deviation of the two figures is about the best indication there is that weights have changed significantly between base and current period and accordingly that the weighting base should be changed. The number base (i.e. the year taken as 100) might be maintained for a longer period by linking new indexes to old. Even if there are theoretical objections to this course they are outweighed by the practical consideration that frequent changes of number base are irksome to users of the indexes.

23. A proposal in this connexion seems worthy of examination, namely that for each price or quantity series two index numbers should always be produced (i) one with the base year as 100; (ii) one with previous year as 100. It can scarcely be questioned that the change in the most recent period is by far the most important and significant: in fact, most of the statements made about current indexes relate to their change since the previous period. More is implied in this proposal, however, than merely dividing the previous period (base-weighted) figure into the current figure. Consumption, import, etc. commodity patterns change more or less continuously in time so that this year's pattern will be more similar to last year's than to a base year's probably several years back. Accordingly, for assessing price or quantity changes of a commodity complex in a recent period, this year's or last year's weights (or a mixture of the two) are more appropriate than are the weights in a base year. Unless the index series is a link-relative Fisher (in which case any period be taken as 100), it is suggested that the index to last year's base as 100 be computed using last year's or current year's weights (if these are available) or an average of the two. This series could be linked by continual multiplication to any year as 100 and, by comparison with the base-weighted series, would indicate when the latter required revision. The linked series need not, of course, be published unless it is preferred to the base-weighted series. Confusion would be likely to ensue by publishing both.

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Treatment of imputed parts of items

24. From the price-quantum viewpoint it seems very desirable that in each relevant item of the accounts the marketed part should be distinguished from the non-marketed (in which case the value is, of course, imputed). The distinction seems essential where, as in primitive societies, subsistence forms a large part of production and consumption and where quantum statistics are more important, if only because they are more firmly based, than current value statistics. In all economies stocks are, of course, an item ipso facto imputed. The case for such a distinction, desirable on general grounds, receives added force from the fact that the concomitant price index, as such, should relate only to the marketed part of the item. The items in the accounts principally at issue in this connexion are private consumption expenditure and gross domestic fixed capital formation (especially in the agricultural sector). In the three-fold form of presentation (value, quantity, price) proposed earlier, it might be suggested that for each item containing a large imputed constituent, the three elements should be shown for the marketed part, the unmarketed part and for the total of the item. Strictly in the price context, the only meaningful figure would be that pertaining to the marketed part. The "price" indexes for the unmarketed part and the total would, however, have a certain usefulness in explaining the change from year to year (or other period) in the current values. It seems difficult to escape from the generalization that every item expressed, however tenuously, in current value terms, is a candidate for factorization into price and quantity.

The double-deflation method

25. It is suggested in this paper that real product should be estimated as the difference between output and input both expressed at constant prices. This method, applied to each sector of the economy leads to no inconsistency: the sum of the real products, so defined, of the sectors adds to the domestic product since the intermediate real products (outputs of some sectors and inputs of others) cancel out in real terms just as they do in current value terms; of course, it is assumed that the deflating price indexes are such that they equate real inputs of intermediate products to real outputs. As regards each sector, the emphasis is on real product, though, in Chapter 2 of the technical report, some tentative consideration has been given to the concept of factor input which it seems desirable should be separately distinguished. This aspect requires much further study.

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26. In theory, at any rate, the word "establishment" could be substituted for "sector" in the previous paragraph, where input and output were regarded as the sums of goods and services which crossed the sectoral boundaries, intra-sectoral transactions being ignored. Exactly the same value for real domestic product of the nation would emerge if the establishment were regarded as the unit, intra-sector sales in real terms would cancel on aggregation. If one's object is only to estimate real domestic product, it is of small moment whether the establishment or the sector is taken as the unit. It might even appear that, at any rate in the manufacturing sector, it would be more convenient to treat the establishment as the unit since, for purposes of deflation, all that is required is a commodity (good or service) - wise aggregation of both inputs and outputs, thus avoiding the sometimes difficult problem of eliminating intra-industrial transactions; and the respective sums (of inputs and outputs) are invariant to the industrial analysis used. One of the objects of the exercise is, however, to produce price index numbers useful for economic analysis and it would appear that the pairs of index numbers (of input and output) weighted according to flows across sector boundaries are the more useful and the more concordant with the logic which informs the system of national accounts. An economic sector is one the members of which have common interests vis-à-vis other sectors and these members must be assumed to be interested in the statistics for the sector as a whole. This is specially true in the case of agriculture. A price index number of agricultural costs which included not only (1) feeding-stuffs, fertilizers, seeds, machinery parts etc. purchased outside the sector but also (2) inter-farm sales of store cattle, corn, seeds etc. would be less useful than an index based on (1) alone. In many agricultural systems the value of (2) is far greater than (1) which would be "lost" in the aggregate index. It would be difficult to interpret the price index of wider coverage: for example, a rise would be to the advantage of farmers selling but a disadvantage to farmers buying. The problem of gross or net aggregation from the viewpoint of quantum or price index number construction requires further study based perhaps on a comparison of the results of using both systems on the data for certain countries (see also paragraph 36 below).

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27. While the double-deflation method, for the purpose of estimating domestic product, is generally regarded as theoretically sound, many difficulties have been experienced in applying it in practice. These are mainly due to lack of information as to prices and quantities and/or values of inputs and outputs, as well as to inaccuracies and other inadequacies of these data when they are available. In applying the method, there seem to be three main sources of error: (1) aberrations in relation of current value input to output (in census of industrial production returns) (2) error in price index of output (3) error in price index of input; and real added value has to bear the brunt of all three types of error. Experience has shown that, especially in industries in which added value is only a small fraction of value of output, the fluctuations from year to year in the index of real added values are too great; at any rate, they tend to be far larger than those of either the index of real output or of real input. This is probably the reason why most countries still prefer to use the method of projecting added values in the base year by quantum index of either output or input (i.e. domestic product of the nation is estimated as the sum product of base year added value by quantum output or input index in each industry), while frankly recognizing that this method makes the large assumption that no structural change (or the relation of input to output) has occurred since the base year. A detailed inquiry into the use of the double deflation method with a wide range of data seems urgently necessary.

28. The viewpoint assumed in the paper is that a price index number, as such, is meaningful only in relation to a gross value flow, for instance consumption, imports, fixed capital formation, production of final goods etc. where these are considered only in regard to the part which entered the market. It is implied that, in general, no single price index number can be devised for deflating an added value (which is regarded as the difference between two deflatable values). There can be no objection, however, to computing "price" indexes of added value as the quotient of current value by the double-deflated difference, provided the character of this "price" index is recognized, namely as a part explanation of the change in current value since the base year.

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Direct or indirect (price deflation) methods of estimation of quantity flows

29. In the technical report the terms "deflated value", "value at constant prices" and "quantum" have been used interchangeably though they imply different computational procedures. If, in regard to each flow, a full schedule of commodities and services expressed in price and quantity terms were available and if, between base and current year, there were no changes in the qualities of the units of goods specified, then the terms are interchangeable on the understanding that if the price index is a Laspeyres the quantity index is a Paasche and vice versa. If one prefers the same kind of formula consistent with the relation  $PQ = V$ , the Fisher can be used. Of course, the prerequisites are never satisfied in practice; in fact the two specified (and there are others) are mutually destructive: if one attaches importance to unchanged quality, the schedule of goods priced will constitute a constantly diminishing fraction of total value as time goes on. Apart from this consideration, in every sector there will have to be a miscellaneous heading in "value only" terms, a dragnet of materials and products, none important enough to be specified by itself, and in regard to which a "quantity" (in the ordinary sense of the term) would usually be meaningless.

30. Value at fixed prices means that each flow (production, imports, consumption, industrial input etc.) is envisaged as a bill of goods and services specified in fair detail as to description with quantities stated in suitable units. The value at fixed prices in the current year is the sum product of the quantities by the base year prices. The hazards of using this method are fairly obvious; in particular it makes no allowance for new commodities and it implies no change in quality compared with the base year. Of course, there are recognized expedients for dealing with new commodities - they can be accorded imputed base year prices, for example by reference to the price trend for similar goods. But the risk remains that all new commodities may not be fully taken into account. Using this method also, some allowance can be made for changes in specification of given commodities but in only limited degree. It must be confessed that, using any recognized method, the quality problem remains the bugbear of index number making. On the whole it seems that the "direct" method applied in the manner indicated must tend to understate the volume flow it is intended to represent.

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31. Of course this method could be improved if even the current value in the aggregate of residual "value only" items in the flow were available. Knowing the general content of this residual value part, it might be possible to devise a suitable deflating price index and the part, when deflated, could be added to the sum product for items with quantity specified. There is no reason why the resulting quantum index should have a downward bias. The practice of using the price index derived from the quantified items for deflating the "value only" residual is to be deprecated. There is usually no good reason to assume that the price trend of the latter is the same as that of the rest, if only for the reason that the representation of items of the raw or semi-manufactured type (subject to fairly marked price fluctuation) will usually be disproportionately large in the quantity part of the schedule, whereas the "value only" part will contain items with relatively stable prices.

32. At least as regards the marketed part of the flow, there is much to be said in favour of deflation simpliciter by a suitable price index number of the whole current value involved, so that the resulting series will be literally a deflated value series, assuming of course that prices in general, at least in the short period, are relatively stable. The total value of output or input of an industry should be ascertainable in the current period. With very detailed price schedules for the industry and weights in some recent period, it should be possible to construct reliable deflating price index numbers. The total current value will include new commodities, and commodities which have changed in quality since the base period. If the wholesale price schedule is sufficiently detailed for the inputs and outputs of the industry, it will be a small matter if varieties drop out of the price schedule: a sufficient number of quotations for the commodity will remain to establish confidence in the resulting index. If a new variety appears, and previously existing competing varieties remain in the price schedule (possibly with lower prices than would otherwise be the case), there seems no good reason why the quotient of the current value by the price index should not give a valid estimate of quantum allowing for quality changes. The quality problem remains only to the extent that all the old varieties of a commodity disappear simultaneously from the market.



Some remarks about prices and price index numbers

33. The viewpoint which informs this paper is that, if current values of flows are available, the preferred method for obtaining the corresponding real (or fixed-price) values is to divide the current values by suitably constructed price index numbers. The emphasis here is on the word "suitably". Even if a well-constructed general price index number is available, it may not be suitable for deflating a major current flow: for instance, an official consumers' price index, as a single figure, divided into the current value of private consumption expenditure does not necessarily give an adequate estimate of real private consumption expenditure, unless by chance the quantum weighting of the index is closely similar to the current consumption pattern. Before deflation the current value should be classified into detailed categories of goods and services and each category deflated separately.

34. In order to be in a position to produce price index numbers suitable for deflating major flows, a very full schedule of wholesale and retail prices and rates must be presumed available for all major commodities in all flows, major and subsidiary. One must assume that representative price quotations (or rates for services) are systematically collected for each well-defined commodity flow above a certain arbitrary value in a recent base period, the commodity flow values being obtained from import and export statistics, censuses of manufacturing and distribution, agricultural output, etc. In such circumstances individual prices can be combined in any way desired to produce, in relation to each major flow, price index numbers for commodity groups if desired, or for sub-flow constituents of major flows. For instance, if there are three sectors in the system (i) rural (ii) non-rural and (iii) external, the consumption flow for deflation purposes should be regarded as the sum of (a) subsistence consumption in the rural sector (b) sales of consumers' goods from the rural sector (c) sales of consumers' goods from the non-rural sector (d) imports of consumers' goods and (e) transport and distribution charges. Identically the same deflators and the same current value flows must be used for these constituents as part of other flows, e.g. (d) is a specific part of imports. If, e.g., consumption, as a single total value, and imports be deflated by single general price index numbers for consumers' goods and imports respectively, discrepancies in the resulting real values are bound to occur

Flows in service branches of economic activity, wholesale and retail trade

35. In the technical report discussion of the factorization of these flows in Table 2 has been relegated to the chapter on actual country practices because, despite the exercise of much ingenuity, so far it can scarcely be said that generally accepted theories have emerged; countries do the best they can with such materials as are available. Some reference may be made, however, to the important wholesale and retail trade sector. In theory the double deflation method could be applied here if current purchases, sales and stocks for the sector were available. According to the method, real income would be computed as real sales plus real stocks at end of period minus real purchases of goods and services and increased stocks at the beginning of the period. As far as is known, however, no country adopts this method in this sector, for understandable reasons. Unless and until the basic data (derived from censuses of distribution etc.) and price sources have attained a high degree of accuracy, it is not to be recommended for reasons stated in the technical report.<sup>2/</sup> Having regard to the fact that, in this sector, the practice widely obtains of deriving selling prices from purchase prices by adding a more or less fixed percentage (the "mark-up") for each type of good it is fairly safe to assume that, in each separate trade (e.g. grocery, drapery etc.), the gross margin (current selling value minus purchase value of goods, with an adjustment for stocks) would, to a close approximation, be a fixed percentage of current value of sales. In such circumstances the deflation of current gross margin by selling price index numbers, trade by trade in the greatest practical detail, is a recommendable procedure. Charges on gross margin like packing materials, stationery, advertising, etc. in real terms can be deducted to give real income.

Periodicity

36. The calendar year is the reference period for SNA in current value terms. Interest is growing rapidly in the possibility of preparing partial or highly consolidated accounts for shorter periods, e.g. calendar quarters, in the conviction that a year is too long a period in which to appraise the economic

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<sup>2/</sup> Chapter 6, paragraphs 166-169.

trend or to make desirable changes in economic policy. Most countries have systems of prices (consumer, import, export and general wholesale) for monthly periods and most of the regular quantum series, if available at all, are computed at monthly or quarterly periods. Accordingly, if and when accounts in current values for e.g., calendar quarters make their appearance there seem to be no compelling reasons why the concomitant price and quantum series should not also be produced. If quarterly current value accounts are to be prepared, there will probably be an increasing tendency to invite industrial concerns etc. to furnish returns for purchases, sales and stocks in aggregate money values instead of (or better still in supplement to) quantities (only) of individual commodities as is generally the case at present. In this case, in applying a single deflation method to outputs or inputs, or the double deflation method, to the estimation of gross domestic product, it will probably be found convenient to deflate gross output and/or gross input values (i.e. the sums of inputs and/or outputs of establishments) as distinct from flows across production boundaries ignoring intra-sectoral transactions. It is not to be expected, in fact, that the elaborate calculations involved in eliminating intra-sectoral transactions could be undertaken more frequently than once a year.

#### Concluding remarks and proposed recommendations

37. As already indicated, the technical report is largely exploratory in character. The report has been distributed to countries for their comment in conformity with the request of the Statistical Commission at its ninth session. A more definitive version of the study will be prepared at a later date taking into account the reactions received from countries. At this stage, however, the Statistical Commission may wish to express its views upon the following particular aspects of the subject and to emphasize the importance of these questions in the development of the theory and practice of a system of price and quantity indexes:

- (1) Balancing of a system of national accounts in real terms;
- (2) Calculations of the "gain from the terms of trade";
- (3) The double deflation method of computing the estimate of real value added for an industry;

- (4) The method of deflation by price indexes versus the method of revaluing quantities at fixed prices for computation of real flows;
- (5) Appropriate methods of revaluing at constant prices the "value only" residuals of accounting flows;
- (6) The isolation of the non-marketed constituents in real flows;
- (7) The appropriate form to be adopted for accounts in constant prices covering periods shorter than a year;
- (8) The preparation of price and quantity indexes to previous year as base, in addition to series to fixed base;
- (9) The problem of quality change in products. (This question is discussed in detail in the companion memorandum entitled "Problems in Collecting Comparable Wholesale Prices", also submitted to this session of the Statistical Commission, as document E/CN.3/246.)

The Commission may also wish to comment upon, or to make recommendations concerning, the need for study of the problems associated with specific and separate measurement of the productivity factor underlying changes in real product and in the nation's terms of trade. (It has been noted that changes in the productivity of factors and changes in the quantity of factor inputs together account for changes in real product, so that the estimates of real product and its constituents provide a logical framework for the analysis of changes in productivity).

38. The Commission may wish to request the Secretary-General:

- (1) to continue to collect information from Governments of Member States on statistics of national product and expenditure in constant prices, on the related price index data, and on the methods of estimation used in computing these indexes;
- (2) to assist countries in the preparation of systems of quantity and price indexes, and to consult with Governments on a continuing basis on their experience in applying particular concepts and methods in the preparation of these indexes;
- (3) to prepare and circulate a report on the subject of a system of price and quantity indexes for national accounts which covers problems of theory and method, and which takes into account the comments received on the draft technical report recently distributed.