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ESTIMATES OF PRODUCT AND EXPENDITURE AT CONSTANT PRICES

(Report by the Secretary-General)

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I. INTRODUCTION

1. At its tenth session in 1958, the Statistical Commission considered the papers, E/CN.3/L.46 and E/CN.3/231, on national accounts in constant prices. The document E/CN.3/L.46 dealt with the concepts, classifications and methods of a system of prices and quantity indexes for national accounts; the other paper consisted of a commentary on selected aspects of this subject.

2. The discussion of concepts and classifications in the 1958 reports was linked to a system of indexes drawn up within a summary framework based on A System of National Accounts and Supporting Tables (SNA). Special attention in the discussion was given to the deflation of non-commodity flows and to the possibilities of constructing a balanced system of accounts in real terms. Practical problems of compiling price and quantity indexes were discussed in terms of existing national practices, and an effort was made to draw conclusions regarding the usefulness of particular methods of estimation.

3. The Statistical Commission, in taking note of the reports commented on the tentative and exploratory nature of much of the conceptual part of the discussion. It suggested that, pending further examination of the various proposals put forward, the attitude of national statistical offices should be one of considerable reserve. This recommendation applied with special force to the tentative proposals relating to the deflation of the income flows in the accounts and to the balancing of the system as a whole in real terms.

4. Generally, the Commission felt that there should be a change in both order and emphasis in dealing with national accounting data in constant prices. It was the Commission's view that consideration of this subject might more appropriately start with the familiar problems of the deflation of flows of goods and services with which countries were faced in their day-to-day statistical practice. At a later stage, the conceptual and practical difficulties attendant on the deflation of flows other than those of goods and services might be dealt with.

5. The Commission recommended that priority in the Secretariat's work on the subject should be given to an examination of the basic problems of deflating the expenditure components of the accounts and of measuring product at constant prices by industry of origin. It noted that, even in connexion with these more limited objectives, considerable difficulties were encountered in practice.

6. Since 1958 the Secretariat has been keeping abreast of current developments in national practices in compiling national accounting data in constant prices. Publication of constant-price estimates of expenditure and product has continued in the Yearbook of National Accounts Statistics, and has expanded in parallel with the increasing volume of data of this kind prepared by countries. In addition, systematic efforts have been made to maintain up-to-date information on the concepts and methods employed by countries in compiling constant-price estimates. Summary descriptions of this kind have been included in the study National Accounting Practices in Sixty Countries;[1/] these will be extensively supplemented in the revision of this publication which will be undertaken in the next few years.

7. The Secretariat has also undertaken work on the conceptual framework of national accounting data in constant prices as part of the revision of the SNA. The proposed revision of the SNA, document E/CN.3/320, incorporates such data into the system. These data relate to the industrial origin of the gross domestic product at market prices, the sources of expenditure on this product, the composition of private consumption expenditures and fixed capital formation, depreciation and the net domestic product at factor cost. Included in the proposed system as well, are implicit price index numbers of the main sources of expenditure on the gross domestic product. The document also deals with the concepts of these series, and the possibilities of expressing income flows in constant prices in terms of purchasing power.

8. The present paper is a preliminary survey of the more important recent developments in national practices in compiling estimates of expenditure and product at constant prices. It covers developments in the objectives and scope of constant-price work and in the techniques of measurement. Particular attention is given to a number of major studies which have appeared recently on the compilation of estimates of product by industry of origin. Incidental attention only is given to the development of systems of price indexes related to constant-price estimates of expenditure and products. This subject is dealt with in the paper E/CN.3/328, "The Gathering and Compilation of Statistics of Prices".

1/ Studies in Methods, Series F, No. 11, Statistical Office of the United Nations, New York, 1964.

9. The first section of this paper deals with developments in the objectives and scope of work on accounting data in constant prices. The major approaches to measurement are the subject of the second part of the paper. The last section of the paper concerns the more detailed aspects of constant-price estimates of the industrial origin of the gross product, considered in relation to the supply of available information.

II. OBJECTIVES AND SCOPE OF CURRENT WORK

A. Over-all Objectives

10. During the last seven years, there has been a general expansion in the scope of official estimates of product and expenditures at constant prices. Little in the way of an over-all pattern appears in the character of this expansion, but broadly it seems to have been directed towards rounding out the compilation of product and expenditure aggregates and more detailed data of the type requested in the United Nations national accounts questionnaire.

11. The sequence of expansion in individual countries appears to be closely related to the development of basic approaches towards national accounting data in current prices. Thus, countries adopting the production approach normally develop constant-price estimates of product by industry of origin before constant-price estimates of final expenditure; countries following a quantitative commodity-flow approach may be able to develop the two types of constant-price data simultaneously. Interrelationships of this type will be found in the summary descriptions of methods in specific countries given in National Accounting Practices in Sixty Countries.

12. The most significant feature of this general expansion has been the development in a number of countries of estimates of real product by industry of origin. Of particular interest for the present study in view of the special problems involved in these estimates is the recent work of some statistically advanced countries. These countries have employed an integrated body of comprehensive and refined techniques in estimating real product according to industrial origin. The widespread use of short-cut methods of estimation lends further point to a discussion of this advanced practice.

13. The increasing attention devoted to estimates of the industrial origin of the product stems largely from the requirements for the data in assessing and planning economic growth and related uses. For example, the data provide co-ordinated measures of the rate of expansion of the various industries and of changes in the structure of the conomy. In combination with data on the labour and fixed assets employed in these industries, the estimates furnish the basis for measuring trends in, as well as the level of, productivity. The use of the double-deflation approach in making these estimates provides data for relating quanta of gross input of commodities to quanta of gross output, and is a step toward the development of input-output tables at constant prices. In this wider context, changes in the volume of gross output of the various industries may be linked to changes in quanta of the various intermediate and final demands; constant-price estimates of product and expenditure may be checked and reconciled in detail, one with the other.

14. By-products of this constant-price work are implicit price indexes of the gross product classified according to industrial origin and sources of final demand. As the constant-price aggregates and indexes are usually based on the Laspeyres formula, the implicit price indexes are of the Paasche type. In some cases, the implicit price indexes are published.

B. Nature of the Aggregates Sought

15. It has already been noted that the discussion is limited to the domestic expenditure and product or related aggregates which can be unambiguously defined in terms of flows of goods and services. In practice a number of alternative measures of these aggregates are utilized, differing in scope and valuation.

16. In terms of scope, the most important distinction is between the SNA concept of domestic product used widely in market economies and the concept of net material product basic to the national accounting systems of the centrally planned economies. A less important distinction arises in the French system, where stress is laid on "gross domestic production" (production intérieure brute) as the aggregate of commercial production.

17. Differences in the basis of valuation of production and expenditure are of special interest even though in many cases the basis adopted reflects essentially

the limitations of the available data. In practice, differences of this kind centre around the alternatives of aggregates at market prices or at factor cost and aggregates gross or net of capital consumption. Of these two sets of alternatives, the former gives rise to the more serious divergence of opinion and practice.

18. For expenditure estimates, general use is made of the market-price basis of valuation. This is the SNA recommendation, and its acceptance is bolstered in practice by the statistical difficulties of deriving comparable factor-cost estimates. The United Kingdom is, perhaps, the only country at present publishing factor-cost estimates of final expenditure as well as market-price estimates at both current and constant prices.

19. A second point to note in connexion with the procedure employed in the United Kingdom is that, in the market price aggregates of expenditure at current and constant prices, imports are valued inclusive of custom duties, and other indirect taxes. At constant market prices, valuation is in terms of base-year c.i.f. prices plus indirect taxes calculated at the rates current in the base-year. The view is taken that this is the valuation of imports which confronts the purchaser and which affects substitution at the margin between different commodities, whether home-produced or imported.

20. There is much less of a consensus in practice on the valuation of the constant-price estimates of the industrial origin of the gross domestic product. The table on these statistics in the proposed revision of the SNA calls for valuation at market prices though the usefulness of estimates included at factor cost is recognized. Market-price valuation is adopted largely on practical grounds. Practical considerations have led to the use of market-price valuation by a number of countries. For example, market-price valuation was adopted in the United States because the use of the factor-cost concept was considered to be currently impracticable. Factor-cost evaluation involved knowledge not only of the indirect taxes paid by each industry, but also of all indirect taxes incorporated in the cost of intermediate purchases. The market-price basis, on the other hand, had the advantage that (i) most data available are of this type, (ii) the aggregates obtained are consistent with the expenditure totals, and (iii) the analysis of expenditure in terms of industrial source is facilitated.

21. Nonetheless, a number of other countries issue factor-price estimates of the industrial origin of the gross domestic product. These countries consider these estimates to be much more useful than market-price estimates and have incorporated procedures for allocating indirect taxes and subsidies by industry in making constant-price estimates. Canada, for example, in justifying its choice of the factor-cost concept, argues in favour of industry measures that are invariant to unevenly applied taxes and subsidies. The United Kingdom considers that market-price industry estimates are not required.

22. There appears to be considerable agreement on the usefulness of constant-price estimates of product by industry on a net, as well as on a gross basis. For some important uses (e.g., measuring productivity) estimates on a net basis should be valued at factor cost. The recommendations in the proposed revision of the SNA call for constant-price estimates of the total net domestic product valued at factor cost, but not of its industrial origin. A step in the direction of net figures is implied in the development of the perpetual inventory method of measuring the stock of capital which is now being undertaken in a number of statistically advanced countries.

23. At the present time, estimates of the product at constant factor prices net of depreciation are compiled by some countries with market economies. In Norway, expenditure and product estimates have been published for some time on a net basis. In the United Kingdom, work on the measurement of capital consumption has been steadily pursued in recent years and replacement cost estimates are now available both by industry and by type of asset. In the centrally planned economies, the basic aggregates are normally net of capital consumption.

C. Forms of Presentation

24. In presenting estimates of product and expenditure at constant prices, most countries follow the system of juxtaposing tables showing current and constant price estimates in absolute terms, occasionally adding a supplementary table on the related implicit price indexes. Other countries adopt the practice of using indexes rather than absolute figures for the presentation of industry estimates. This type of presentation does not demand as high a degree of accuracy in the basic

data as the presentation of absolute figures, and it facilitates comparison between trends in quanta and prices of outputs. However, absolute figures are useful for a number of the purposes for which the constant-price data are wanted, and the use of both types of presentation is desirable.

III. APPROACHES TO MEASUREMENT

25. The methods employed in making constant-price estimates depend of necessity on the nature of the aggregate in question and the basic information available. In general, differing approaches are utilized in estimates of expenditures on the product and its industrial origin.

A. Expenditures on the Gross Domestic Product

26. Where the required basic data are available, use of the commodity flow approach is common in the case of expenditures on the gross domestic product, excepting government consumption expenditure. Constant-price estimates of the individual commodities, or as detailed a class of commodities as is feasible, that make up the category of the expenditure, furnish the building blocks for these estimates. The detailed estimates are obtained through applying indicators of quanta to base-year data or deflating current-price estimates for the year in question by the appropriate price indexes. Deflation is commonly utilized in the case of capital formation in view of the lack of suitable indicators of quanta for fixed assets and the diversity in content of inventories. Though more use is made of indicators of quanta in the case of private consumption expenditures and external trade, price index numbers are often favoured because of limitations in the coverage or comparability of the available indicators of quanta.

27. Basing the estimates on detailed classifications of expenditures largely avoids the injection of the weighting pattern and deficiencies of the quanta or price indicators utilized. The weighting pattern of these indicators may differ from the base-year composition of the expenditures in question, and the weights and base-years of the indicators may not be consistent, one with the other. Further, using base-year weighted price indexes yields constant-price estimates which are current-year weighted. Usually, constant-price estimates of the Laspeyres type are sought. Detailed indicators of trends in price or quanta are also less likely to contain incomparabilities in the items covered.

28. In the case of government consumption expenditures, estimates in constant prices are complicated by the inclusion of employee compensation. This element also carries much weight in the expenditures of private non-profit institutions. In a number of countries, these estimates are built from separate constant-price estimates of the various commodities consumed, of compensation to employees and, sometimes, depreciation. Commodities are dealt with in essentially the same fashion as in the case of other sources of expenditure on the product. Compensation is usually deflated by the most appropriate price indexes of wages and salaries, and the resulting estimate is utilized as the measure of contribution of general government to the real product as well. In the United Kingdom, however, the same measures of real outputs rather than real inputs are favoured in the case of consumption expenditure and contribution to the product of general government. In practice, a part of the constant-price estimates of these flows is made in terms of inputs because of the lack of suitable indicators of real output.

B. Industrial Origin of the Gross Domestic Product

29. In estimates of the industrial origin of the product in constant prices, the double-deflating approach is generally accepted as conceptually the most satisfactory. This method is usually employed in the case of the centrally planned economies, and has been adopted as the basis for practical work in a number of the statistically advanced market economies. However, the extent to which the double-deflation method is in fact employed is constrained by the availability of suitable indicators for the quanta and price components of gross outputs and inputs. Appropriate measures may not be available with respect to the real gross output of some industries or the real commodity inputs of other industries, and recourse is taken to one of these measures only in making the constant-price estimates. In the case of a few other industries, it may not be possible to estimate either element of the double-deflation method from available data; use is made of the indirect measure of the real value added by the industry, for example, inputs of labour adjusted for changes in productivity. Limitations in the use of the double-deflation approach may also arise from anomalies encountered in the constant-price estimates because of marked changes in the relative prices and quantities of the various gross inputs since the base year.

30. In the double-deflation method, the real gross outputs and inputs of each industry should, in principle, be derived from estimates for individual commodities, or detailed class of commodities (i.e., goods and non-factor services) making up each of these flows. In practice, only a portion of the gross output may be delineated in sufficient detail; suitable indicators of trends in quanta and/or price can be gathered for the same or even a smaller, part of gross output only. In these circumstances, the best that can be done is to impute the trends, preferably in price, for this portion to the total of gross output. Generally, much less detailed basic data are available on the gross inputs of commodities than gross outputs, in particular annually, and suitable quanta or price indicators are not readily available for such inputs as business services. Consequently, estimates of real gross inputs are usually considerably less exact than the estimates of real gross outputs.

31. Not infrequently, the available detailed data on gross inputs, and perhaps gross outputs as well, are so limited that index numbers of industrial production and the like are employed to extrapolate the base-year estimates of the industrial origin of the gross domestic product. These index-numbers should be as detailed as is feasible and have weighting patterns reflecting the industrial structure of the gross domestic product during the base-year. It is also desirable to shift the base-year of the indexes frequently enough so that the weighting pattern reflects changes in the industrial structure of the product and the relationships between gross outputs and inputs.

32. In view of these uses of traditional indexes of output, efforts are being made to assimilate the indexes within the over-all system of constant price work. For example, in both Canada and the United Kingdom, the indexes of industrial production have been designed so that they may be utilized in estimating the industrial origin of the real product without modification. In the United Kingdom, the index of "net output" in agriculture was recently substantially revised to bring it into line with standards in other industries; it is now incorporated into the estimates of real product with only minor modifications.

33. Input-output tables classified in sufficient detail, where the entries in each cell of the main body of the table might be factored into quanta and price components, could furnish the ideal basis for the double-deflation method. It may

be feasible for a number of statistically advanced countries to compile such a table at five-year, or somewhat shorter, intervals of time. These input-output tables would provide the basis for detailed constant-price estimates of the industrial origin of the gross domestic product during bench-mark years, as well as for detailed adjustment of these series for the intervening years.

C. Reconciliation of Product and Expenditure Estimates

34. The type of input-output table mentioned above would also provide the means of making integrated constant-price estimates of the industrial origin of and sources of expenditure on the product. At present these estimates are independently made, at least in some important respects, in the case of most countries and therefore must be reconciled and adjusted, one to the other.

35. Countries which make real estimates of expenditures on the product at market prices and of the industrial origin of the product at factor cost, find it necessary to reconcile the estimates for these differences as well. In the United Kingdom, for example, there are two main steps in this process. First, the market-price estimates of final expenditure are adjusted in detail for specific indirect taxes and subsidies at the rates applicable in the base year. This is sometimes carried out by multiplying quantities by the appropriate ex-tax prices of the base-year. Secondly, the estimates are adjusted in broad groups for non-specific indirect taxes and subsidies, again in terms of base-year rates. In Canada, the original procedure was to raise the industry estimates to a market-price basis. This was done rather roughly by adding net indirect taxes by industry to the original factor cost weights and then projecting the results by the original industry indexes.

D. Formulae and Weight Base

36. The advantage of the base-weighted Laspeyres-type index for the measurement of changes in expenditure and product at constant prices is largely upheld in recent work. It is found to be more practicable to construct and easier to interpret than indexes of the Paasche, Marshall-Edgeworth or Fisher Ideal types. Problems which do arise when deflation of current values has to be undertaken and construction of current-weighted price indexes is not practicable can be reduced in importance by deflating at a fine level of detail.

37. The bias which normally appears in base-weighted indexes in this work is well recognized and leads to periodical changes in the base year. In a few countries, Fisher Ideal or Marshall-Edgeworth indexes are calculated from year to year to meet this problem; a series is derived by chaining these indexes. This approach also reduced the asymmetry between Laspeyres-type indexes of output and implicit Paasche-type indexes of prices.

38. In practice, the base-year is generally determined by the availability of suitable information from major statistical inquiries into productive activity. In the statistically advanced countries, an important influence has also been the availability of pertinent bench-mark information in the form of an input-output table. The recommendations of the Commission on the timing and frequency of changes in the base-year have also influenced country practice.

39. A general problem of weighting arises in practice in the case of industry estimates since normally base-year product estimates are not available in sufficient detail to match the individual indicators of output used. In recent studies, the solution adopted most frequently has been to use unit selling values as weights at the highest level of detail and then to combine the resultant indexes on the basis of value added to correspond with the available distribution of gross product. The limitations of procedures of this type are recognized and efforts are usually made to obtain better approximations to relative gross product at earlier stages.

IV. TECHNIQUES OF MEASUREMENT AND THE AVAILABLE INDICATORS

40. In this section of the paper the techniques adopted by countries to estimate the real product originating in various industries will be summarized. The discussion will illustrate the dependence of the methods chosen on the character of the industry and the available indicators of its activities.

A. Agriculture, Forestry, Hunting and Fishing

41. In most developed countries, the array of price and quantity data available for this sector makes possible a relatively detailed application of the double-deflation method. In many of them, indexes of agricultural output already

available can be used without extensive adjustment to provide the necessary sector estimates and, in some, these indexes have been brought into full conformity with national accounting requirements.

42. A net output index for the sector is normally constructed by the detailed valuation of output and input at base-year prices or unit values. In some countries, output and input are measured gross of intra-sector sales and purchases while, in others, an attempt is made to eliminate such transactions at the start of the calculation. Occasionally, a three-year price average is adopted for the purposes of valuation to reduce the effect of fluctuations arising from weather conditions and other factors.

43. In the United Kingdom work, for example the agricultural index incorporates some 250 items of output each carrying its own base-period price weight. Many of these items reflect the division of the output of specific products to allow for differences in valuation arising from differences in quality, season of sale or type of use. Thus, quality variations are taken into account in such cases as wheat (millable and potentially millable), barley (malting and distilling, feed, etc.) and sugar-beet (sugar-content); seasonal variations are taken into account for wheat, barley and oats and also for some horticultural crops; and use variations are taken into account in such cases as milk (human consumption and manufacturing).

44. On the input side, some 400 items are distinguished, each carrying a separate price weight. About 220 of these represent fertilizers, feeding-stuffs, seeds and livestock while the remainder represent expenses associated with the operation of machinery, maintenance work and miscellaneous items. Indicators are normally based on quantities, except in the case of minor items where estimates of current value are deflated by price indexes. Outlays on maintenance are estimated as a fixed proportion of total farm rents (including imputed rents of owner-occupied farms) and then deflated by an appropriate cost index.

45. Government subsidies on output and input are taken into account by valuing specific items of output at the gross price received (inclusive of subsidy) and specific items of input at the unit cost incurred. Subsidies such as those for ploughing, rearing calves and maintaining hill sheep and cattle, which cannot be allocated to specific items of output and input, are dealt with separately by

valuing them at the average rates of payment prevailing in the three-year base period.

46. For other industry groups in this division, such as forestry, hunting and fishing, gross output indicators are generally employed. These are normally derived by the valuation of quantities at base-year prices or unit values.

B. Mining, Manufacturing, Electricity and Gas

47. Since these sectors are normally covered by conventional indexes of industrial production, a relatively good basis is already available in a number of developed countries for the construction of related indexes of gross product. In some countries, such as Canada, substantial revisions have been made to the index of industrial production to bring it further into line with national accounting requirements, and some or all of the components of the independent indexes may be taken over without adjustment as part of the national accounting tabulation.

48. While lack of data generally limits the use of net output indicators, a few countries are in a position to implement the approach over a substantial range of activity. Thus, in the Canadian work, it is found possible to derive net output indicators for activities representing 44 per cent of the base-year product of manufacturing. Gross output (quantity) indicators account for 29 per cent of the total weight, deflated output indicators for 16 per cent, material input indicators for 9 per cent, and man-hour indicators for 2 per cent. The net output indicators are based on census value added rather than true net output and are derived by exploiting the basic data on quantities and values of products, materials used and fuel and electricity consumed, given by the Census of Manufactures.

49. In the United States work, the nature of the information available for the manufacturing sector suggested an approach based on the separate deflation of output and input by price indexes. The Bureau of the Census provides information for each industry on the current value of output (value of shipments and inventory change) and the current cost of materials, while the Bureau of Labor Statistics provides the basic wholesale price indexes used for deflation.

50. The main problem in this work is to derive price indexes for each industry which are representative of the current-year output or input mix. In the case of output, this is generally done by using the annual Census data on the total value of shipments of each product class; where secondary output is significant, the output mix is estimated by projecting the patterns found in the Census years 1947, 1954 and 1958. The price indexes which are combined with the above current-year weights represent composites derived from a special retabulation of detailed commodity wholesale price indexes. This retabulation groups the individual commodity indexes to correspond to the Census product classes, using weights derived from the data on shipments of individual products given in the 1954 Census of Manufactures. A similar technique is adopted for input, though in this case, for lack of information on the current-year pattern, the weights used to aggregate the individual commodity indexes are derived uniformly from the pattern shown for each industry in the 1947 inter-industry relations study.

51. Gross output indicators are normally used for the mining sector since intermediate purchases are relatively small. This is true for Canada and the United Kingdom and also for the United States, where the index used is a weighted average of the production indexes for separate mining activities compiled by the Federal Reserve Board.

52. Electricity and gas supply are dealt with in different ways in the three countries mentioned. Both Canada and the United States derive net output indicators for electricity supply, the latter by revaluing kilowatt-hour sales to each class of customer by the corresponding unit revenue in the base year and then deducting estimates of intermediate purchases obtained by deflating current-value figures by wholesale price indexes.

53. Net output indicators are also used in Canada for gas supply. In this case, the total volume of natural gas produced is divided not only by category of consumer (domestic, industrial, miscellaneous) as in the case of manufactured gas but also by region of production (Eastern and Western Canada). This makes it possible to take into account the substantial price differentials which exist between the two main regions.

C. Construction

54. This is traditionally a difficult sector in statistical work and some of the problems are apparent in the methods adopted in establishing sector indexes of product. In Canada and the United Kingdom the approach is similar: gross output indicators are developed for the main types of construction by deflating estimates of the current value of work done by specially constructed cost indexes. These cost indexes are derived as weighted averages of indexes of building material prices and construction wage-rates. In both countries, the types of construction differentiated are residential construction, non-residential construction and repair and maintenance work undertaken by contractors. A difference in coverage arises, however, through the inclusion in the Canadian estimates of all new work undertaken as own-account construction.

55. In the United States work, the basic statistics used are annual estimates of (i) new construction in current and constant dollars and (ii) maintenance and repair activity in current dollars. These series cover contract and own-account construction and are reduced to a contract construction only basis by the use of ratios derived from the 1947 inter-industry study. The current-dollar estimates of maintenance and repair work are then deflated using a combined index of construction wage-rates and wholesale prices of purchased materials, prepared with the help of information on the pattern of input from the 1947 inter-industry study. Material costs at constant prices are obtained for both elements by applying a constant percentage to the total current-dollar output and deflating the results by a weighted average of wholesale price indexes for construction materials, using relationships from the 1947 inter-industry study.

56. These steps lead to annual totals of net output in current and constant dollars and to the derivation of implicit price deflators of net output. The final step is to apply these deflators directly to independently derived estimates of the gross product of the sector expressed in current dollars.

D. Transport, Storage and Communication

57. This sector covers a wide range of activities not generally subject to census-type inquiries. Special inquiries are usually necessary, therefore, to establish the relationship between the various available indicators of activity

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and the sector product as a whole. The relative scarcity of basic information on input is reflected in the widespread use of gross output indicators.

58. For most of the main forms of transportation, figures of passenger-miles and freight ton-miles, suitably differentiated in terms of contribution to net revenue, constitute the basis of the system of indicators employed. Thus, in the United Kingdom work, rail passenger traffic is divided into ordinary, early morning and season and rail freight traffic into merchandise and livestock, minerals and coal and coke. Less precise measures of net output of a similar type are used in the case of sea transport: for example, tanker activity is measured by the tonnage in operation adjusted for changes in average speed, and activity of coastal vessels by the number of arrivals and departures with cargo.

59. Both Canada and the United States make frequent use of price deflation in deriving gross output indicators in this sector. In the United States work, indicators of rail transport activity are derived by deflating passenger and freight revenue by indexes of the respective revenue per passenger-mile and per freight ton-mile, and indicators of road passenger transport activity by deflating total revenue by the consumer price index for transit fares. In both countries, net output indicators are derived where possible by developing constant-price measures of purchases of materials such as fuels, oils and tyres.

60. In the communications sector, gross output indicators of various kinds predominate. In the telephone industry, these indicators may be based on (i) number of exchange connexions, (ii) numbers of trunk, local and international calls and (iii) number of private wire rentals (United Kingdom), on the number of telephones by type and the number of long distance calls (Canada) or on the separate deflation of revenue from intra-state and inter-state calls (United States).

E. Wholesale and Retail Trade

61. Methods in this sector are relatively uniform in the countries studied, all three depending in one form or another on indicators of gross output. In the United Kingdom, three major types of wholesale trade are distinguished corresponding to the markets served (retail business, other business and export) and indicators are derived from estimates of the corresponding volume of goods turned over. In

the case of deliveries to retail businesses, indicators are derived from the constant-price consumer expenditure estimates, pending the preparation of detailed indexes of the volume of retail sales. The same indicators are used for the major part of activity in retail trade.

62. In the United States, estimates of retail and wholesale sales in current dollars are available by type of outlet and these are deflated in detail by price indexes developed from the elements of the Consumer Price Index and the Wholesale Price Index prepared by the Bureau of Labor Statistics. The output indicators so obtained are then aggregated using as weights the 1954 margin estimates (operating expenses and profits) for each type of outlet.

63. In Canada, the procedure is similar. In the case of wholesale trade, estimates of sales of major commodities by kind of business and by type of activity are derived from the decennial censuses of distribution and are deflated with the help of all available price data. The results are projected for intercensal years by a variety of indicators such as deflated retail sales in a related store-type group or the volume of production in a related industry. The output indicators obtained in this way are combined using gross product weights independently derived for each type of store.

64. In the case of retail trade, the procedure is simplified by the availability on an annual basis of current-dollar estimates of sales by type of store. Deflators draw on a wide range of price relatives and these are combined using weights based on commodity detail derived from the decennial censuses of distribution. The weighting system makes use of estimates of gross product by type of store largely based, as in the case of the wholesale trade indexes, on the decennial censuses and annual income-tax return data.

F. Banking, Insurance and Real Estate

65. For most elements of this sector, techniques of measurement diverge widely between the three countries. This reflects in many cases both differences in data availability and differences in conceptual approach.

66. In the case of banks and other financial institutions, the Canadian procedure is the simplest, involving the use of labour input indicators derived by deflating labour income by related indexes of wages and salaries. In the more elaborate

procedure employed in the United States, gross product indicators are derived by the separate deflation of actual and imputed receipts and intermediate purchases. For the deflation of imputed receipts, estimates of interest and dividends received and interest paid are obtained by deflating holdings by the Consumer Price Index and applying the average 1954 interest and dividend rates. For service charges, the deflator is the corresponding constant-dollar expenditure series and, for other income, the deflator is a composite of the implicit deflators for interest received and service charges. Data on intermediate purchases are not available in sufficient detail for item-by-item adjustment and are deflated as a total by a composite price index constructed with the help of the 1947 inter-industry study.

67. In the United Kingdom work, more specific indicators of activity are used and banking services are divided between services to depositors and services to borrowers. For the former, the main indicators are number of cheques cleared and total deposits deflated by the Consumer Price Index; for the latter, the value of bank advances outstanding is deflated by the Consumer Price Index. Similar types of indicators are used for other financial institutions.

68. In the case of the insurance industry, the methods adopted in the United Kingdom and the United States are similar at some points. For non-life business, for example, indicators are derived by the deflation of the excess of premiums over claims, the deflation in the case of the United Kingdom being carried out by price indexes varying according to type of business. For life-insurance business, on the other hand, indicators are obtained in the United States work from the constant-dollar expenditure estimates (derived by deflating the expenses of handling life insurance) while, in the United Kingdom work, indicators are obtained by deflating sums assured or life and annuity funds held by insurance companies by the Consumer Price Index.

G. Ownership of Dwellings

69. Methods here are relatively simple in all three countries. In both Canada and the United Kingdom, indicators are derived from the corresponding estimates at constant prices of consumers' expenditure on rent. In the United States, a gross product deflator is directly calculated by taking a weighted average of a

price index for total receipts and a price index for intermediate purchases. For total receipts, the index is a composite of the rent element of the Consumer Price Index and the farm rent index; for intermediate purchases, the index is a composite of the consumer price index for maintenance and repairs and for utilities.

H. Public Administration and Defence

70. This is again a sector where techniques reflect in part differences in conceptual approach. In practice, labour input indicators predominate. In the United Kingdom, the administrative activity of central and local governments is measured by deflating the wage and salary bill by indexes of rates of earnings. The activity of the armed forces and fire and police services, on the other hand, is measured by weighted indexes combining changes in numbers in each grade. The procedure is essentially the same in Canada. In the United States, on the other hand, over-all activity is measured by the corresponding constant-dollar expenditure component of gross national product (government purchases of goods and services).

I. Services

71. In this broad sector, there are substantial differences in emphasis on the various basic types of indicator. Thus, in Canada, labour input indicators are used for many activities which in the United Kingdom are accounted for by output indicators. In the United States work, general use is made of indicators derived from the corresponding constant-price expenditure elements of gross national product (services items in personal consumption expenditures).

72. The United Kingdom approach is exemplified by the indicators used for education and health services. In the former case the total weight is divided between input indicators based on the deflated wage and salary bill and output indicators based, for example, on the number of pupils or students on registers. Similarly, in the case of health services, the total weight is divided between input indicators based, for example, on the deflated wage and salary-bill or the number of doctors in the National Health Service and output indicators based, for example, on number of occupied beds or number of outpatient attendances.

V. CONCLUSION

73. The above review of recent developments in this field indicates a general tendency among countries to expand the scope of their constant-price estimates of product and expenditure and to improve and refine the conceptual and statistical basis of their existing series. This trend appears to reflect in large part the rapidly-widening demand for reliable estimates of this kind to use in measuring and analysing economic growth and productivity change. A particularly important development which has been noted is the general expansion of detailed work on the estimation of real product by industrial origin and the related efforts in some countries to develop systems of real product and expenditure estimates articulated within the framework of input-output tables.

74. The review suggests that, while there has been an all-round improvement in recent years in methods of estimation of real product by industrial origin, a considerable number of significant problems remain at both the conceptual and the statistical level. These include (i) problems of identifying and measuring the output of services of various kinds, (ii) problems of obtaining adequate statistical information, for example, on the composition of certain types of output and on the composition of input in general and (iii) problems of integrating traditional indexes of sector output within the broader framework.

75. In the light of the present discussion and with a view to the further exchange of national experience in this field, the Commission may wish to recommend the preparation of a comprehensive technical manual on the subject which would (i) deal generally with objectives, concepts, approaches to measurement and techniques of measurement, (ii) give special attention to issues arising from the organization and development of the work within the over-all national accounting framework and (iii) appraise, in the light of further research, alternative solutions to the principal conceptual and statistical problems encountered.
