
SUB-COMMISSION ON STATISTICAL SAMPLING

STATISTICAL COMMISSION

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USE OF SAMPLING IN PREPARING NATIONAL INCOME
ESTIMATES IN PARTICULAR FIELDS

Paper prepared by the Secretariat for consideration
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1. In document E/CN.3/Sub.1/7 (5 August 1948), the Secretariat summarized the methods used for evaluating the national income and related aggregates. It was stated that there exist three usual approaches to the measurement of national income, each reflecting a different and significant aspect of the same complex aggregate:

(a) As net national product, i.e., the aggregate of the net values added, originating in all branches of economic activity, together with net income from abroad;

(b) As the sum of distributive shares, i.e., the aggregate of income payments accruing to the factors of production in a specified period; these payments take the form of wages and salaries, interest and dividends, profits, rent etc.;

(c) As net national expenditure, i.e., the sum of consumers' and government expenditure on final goods and services, plus domestic net capital formation and net foreign investment.

2. It was also stated that in estimating the national income and related totals as much use as possible is made of available economic and financial statistics and that only if adequate statistical information is not available is it customary to attempt to collect basic data through special inquiries. Furthermore, it was concluded that the recommendations of the Sub-Commission regarding the use of sampling procedures, if adopted in the field of economic and financial statistics, may lead also to improved basic statistics for the estimates of national income. There remain certain fields for which information is usually not obtainable from ordinary statistical sources. The main purpose of last year's paper was to indicate a list of problems of national income research where the application of

sampling methods may be particularly helpful for obtaining essential information.

In the following paragraphs two examples of problems are dealt with in greater detail to illustrate the methods used in measuring national income and to indicate in what respect the application of sampling may be useful.

The first deals with the measurement of agricultural income, the second with a research project on the measurement of income originating in manufacturing and commerce, recently proposed in Sweden.

The measurement of agricultural income

3. The statistical measurement of income originating in agriculture is part of the wider problem of preparing estimates of national income by industrial origin. Agricultural income has been chosen as an example because it is an important component of the national income of many countries, and because any attempt to measure it raises many problems of a conceptual and methodological nature which must be examined before the actual statistical evaluation can be undertaken. These problems are of particular importance also to under-developed countries where agriculture often is a very important branch of economic activity.

4. In the first place, it is necessary to define what economic activities shall be included under "agriculture." As a rule forestry, hunting and fishing are excluded. Practices differ with respect to the inclusion or exclusion of agricultural services such as corn shelling, hay baling, threshing, fruit packing etc., which are included among agricultural income in Denmark and Puerto Rico, but excluded in Holland, whereas in the United States only certain agricultural services are included. The Statistical Office of the United Nations has proposed the adoption of the definition of agriculture including livestock production as given in the International Standard Industrial Classification of All Economic Activities:

"All farms regardless of kind of ownership and type of operation. A farm for purposes of industrial classification is defined as all land used wholly or partly for agricultural production, that is, growing of field crops, fruits, nuts, seeds, vegetables, flowers, both in the open and under glass; tea, coffee and rubber plantations; and the production of livestock, milk, wool, poultry and eggs, honey, rabbits, fur-bearing animals, silk worm cocoons etc. To include also agricultural services and related activities such as cotton ginning and compressing, corn shelling, hay baling, threshing; services for animal husbandry; horticultural services such as contract spraying and picking, fruit packing, pruning; and the operation of irrigation systems."

Food manufacturing industries, such as abattoirs and meat-packing plants, manufacture of creamery and processed butter, natural and processed cheese, condensed and other types of concentrated milk are all classified under Manufacturing.

Veterinary services are classified under Medical and Other Health Services.

As indicated below, this definition has to be supplemented by specifications concerning the treatment of certain activities not explicitly mentioned in the International Classification.

5. Secondly, it is necessary to specify which elements of income shall be included under agricultural income. For example, rents on lands paid to real estate companies or non-agricultural landowners may be included under income from real estate instead of including it under agricultural income. This is the practice followed in the United States. In the national income estimates for Bulgaria prepared by Dr. P. Kiranoff, all rents on land are excluded from agricultural income and shown separately together with other income from real estate. In the estimates for the Netherlands and several other countries agricultural income includes all rents on lands irrespective of who is the owner.

Government subsidies to agriculture are also treated differently. In Denmark and the Netherlands, as well as in most countries showing the national income at factor cost, they are included in the national income and therefore also in agricultural income. However, in such cases practices may differ with respect to certain subsidies. Thus, subsidies for improvement of lands may or may not be considered an element of agricultural income. Government subsidies paid for not producing at all are sometimes considered a transfer payment from the government to farmers, and on that ground are not included in the estimates of agricultural income.

Furthermore, certain items which are not expressed in money may or may not be imputed to income from agriculture. In Bulgaria, Denmark, Norway and the Union of South Africa (since 1946/47) the rental values of farm dwellings are included under income from real estate, whereas in Holland and also in the Union of South Africa before 1946, they are included in agricultural income. Imputed incomes for activities such as repairs of buildings, improvement of land, spinning and weaving carried out by the farmers or members of their families may also be included to a varying degree.

6. The Statistical Office of the United Nations has proposed to define agricultural income as the aggregate of all income payments accruing to the factors of production engaged in agriculture in a specified period; these

...in the form of wages, entrepreneurial incomes, interest, rent
...definition refers to payments for services rendered by factors
...provided by residents. Consequently, it excludes wages paid
...workers from neighbouring countries and rent paid to foreign
...but includes such incomes received by residents temporarily
...abroad in agriculture or owning farmlands in foreign countries.
...agricultural income may alternatively be defined as the aggregate of
...values added in agriculture, i.e., the value of agricultural output
...the value of the goods and services bought from other enterprises and
...in the process of production, less the cost of maintaining capital
...and less indirect taxes. In many cases this is the method actually
...in measuring income originating in agriculture. However, for the
...of discussing the problems involved in defining agricultural income
...definition mentioned above is more convenient.

Basis of valuation: National income usually refers to the incomes
...in a period of a year. For most purposes the calendar year may
...be adopted as the unit. However, in agriculture the agricultural
... (or crop year) is sometimes used as the time unit. This has the
...that the figures cannot always be reconciled easily with data
...other components of the national income. Furthermore, the agricultural
...is not the same for all countries. If the calendar year is adopted
...basis certain receipts in agriculture may originate in production of
...years, and output of the current year may reflect itself only in
...incomes of future years. However, to some extent the same problem may
...if the agricultural year is adopted as a time unit. To bring the
...of agricultural income as much as possible in agreement with the
...of national income, it is suggested that the calendar year be
...as a basis and that agricultural income be computed on an accrual
...instead of on a cash basis. Thus an increase in the value of livestock
...to changes in prices should be considered part of the income of
...year. Accordingly, receipts from the sale of livestock are
...income of the current year only to the extent that they result
...output in the current year. Increase in stocks held by farmers also
...itates incomes of the year under review.

Incomes of the factors of production are taken before direct taxes
...of all indirect taxes with the following specifications and subject
...other specifications under 9-13:

(a) Wages are defined so as to include all income in kind and
...employers' and employees' contributions to social insurance.

/(b) Rents

(b) Rents, excluding rents on farm dwellings, are taken net of depreciation allowances, costs of maintenance and repairs, business insurance premiums, real estate taxes, taxes for the maintenance of roads, waterways etc.

(c) Entrepreneurial incomes are defined as gross value of output less all business expenses for raw materials, fertilizers, veterinary and other services, wages, rent including imputed rent on farmers' property, interest, depreciation allowances, business insurance premiums, indirect taxes, maintenance and repairs etc.^{1/} With respect to outlay for tools, implements etc., it is necessary to define the borderline between current business expenses which may be deducted and capital outlay which may not be deducted. For this purpose tools and implements with a duration of life of more than one year may be defined as capital goods.

(d) Interest on mortgages and other loans is included since agricultural income is so defined as to include all incomes paid to factors of production engaged in agriculture.

9. Treatment of subsidies: The definition of agricultural income adopted is consistent with the definition of national income at factor cost.^{2/} Therefore it includes government subsidies received except for certain special cases where a different procedure may be followed. Subsidies to agriculture may be classified into three groups:

(a) Subsidies related to current production. They enable farmers to sell products at lower prices than otherwise would have been charged or to receive higher incomes than they would otherwise have received.^{3/}

^{1/} This definition automatically includes imputed wages for work done by members of the farmer's family.

^{2/} The problems of statistical measurement that arise in establishing the breakdown of national income at factor cost by industrial origin are not discussed here. If, as is often the case, the net value added method is followed, indirect taxes less subsidies must be deducted from the gross value of output of each branch of industry. This requires the allocation of indirect taxes less subsidies by industries which may present a statistical problem.

^{3/} Richard Stone advocates a different treatment of the latter group of subsidies (see Measurement of National Income and the Construction of Social Accounts, Studies and Reports on Statistical Methods, no. 7, p. 34, first paragraph). He suggests treating as subsidies for the purpose of measuring national income subsidies resulting in lower prices to consumers, and to treat those subsidies which do not lower prices but result in higher incomes to farmers as part of government expenditure

(d) Subsidies for not producing at all.^{1/}
(e) Subsidies for improvement of land and similar capital investments. It is suggested to treat such subsidies, which are frequently given in times of war, as public capital expenditure. If this is done they will not appear as an element of agricultural income.

Imputations of non-monetary items.

(a) Agricultural income includes farmers' consumption of own produce valued at prices paid to farmers. The item includes also the output of vegetables, fruits and other products grown solely for the purpose of feeding farmers' families.^{2/}

(b) The rental values of farm dwellings are, if possible, to be excluded.

(c) Imputed income for work of a non-agricultural nature, done by farmers to satisfy own needs, such as repairs of stables and implements, maintenance of roads and ditches, spinning, weaving etc., is excluded from agricultural income.

Imputed income from gardening by the urban population, which may be of some importance in times of war, is to be included in agricultural income. However, proceeds from gardening for pleasure are to be excluded.

Revaluation adjustments: Since capital gains and losses are to be excluded from national income, all positive or negative incomes due to revaluations must be eliminated. Very often the method of measuring agricultural income is such that it automatically excludes capital gains and losses.

Other elements of income: Income received by farmers from lodgers, tenants etc., is to be excluded, except for the value of food delivered, which is an element of agricultural income. In practice detailed imputations may be difficult to carry out. Special cases that may arise in relation to other elements of income will have to be considered on the

Stone (op. cit. p. 34) prefers to consider such payments not as subsidies but rather as transfer payments from the public sector to agriculture, given in relief. The Statistical Office believes it more practicable to treat the first and second types of subsidies in the same way, chiefly because the attempt to distinguish between the two types of subsidies may involve difficult problems of incidence of such payments, and also because the nature of a subsidy may change when economic conditions change. This has come to be realized particularly during and after the war when prices changed considerably. It would have been difficult to alter the treatment of the same subsidy for the purpose of measuring national income in different years.

In the United States the latter item is excluded.

basis of the principles set out.

14. As indicated under 6, statistical methods used in various countries for estimating agricultural income are usually based on the net value added method. However, the definitions which form the basis of the estimates are often not explained in such detail as may appear desirable from the analysis in the previous sections. With respect to details of measurement, the techniques used differ considerably. On the basis of the net value added method, income originating in agriculture is obtained by deducting from the gross value of output all outlay on raw materials etc., obtained from outside the agricultural sector and used up in the productive process. The gross value of agricultural output may be derived from detailed statistics of output and prices. For all products for which such information is not available, other means have to be used. It is clear, therefore, that the nature of the estimates and the methods of evaluation to be used depend very much on the availability and the quality of available statistical data. In countries with highly developed agricultural statistics, the methods used will be very different from those in countries with less developed statistics. In the latter countries, the estimates will often have to be based on very scanty material, supplemented by assumptions made on the basis of information received from agricultural economists and other experts. The extent to which sampling methods can be used will differ from country to country. In highly developed countries sampling methods may be a useful device to obtain information on the various expenses for raw materials, repairs and maintenance, depreciation and other business costs, which must be deducted from the gross value of output to arrive at the net value added. Information on a number of such items is usually not obtainable from the regular agricultural statistics. Horticulture is a branch of agriculture for which complete statistics are usually difficult to obtain, and where, therefore, the application of sampling methods may be useful for obtaining necessary information.

15. In countries with very detailed government regulations concerning agricultural output and prices, detailed data on cost accounting are usually available.

For example, in the Netherlands, there exist government accounting agencies in each of the eleven provinces of the country, which collect detailed data on the accounts of samples of farms (covering from 5 to 10 per cent of the total number of farms) carefully classified by types, size, geographical districts according to quality of the soil etc. Although collected for other purposes, the data have been very useful also in connexion with the annual census of agriculture and various statistics of agricultural output in that they provide additional information required to prepare

In under-developed countries methods used for estimating national income will necessarily have to be of a different character. Agricultural statistics are usually available for a small number of main crops only. Because of the high costs involved and for other reasons such as illiteracy of the population and lack of administrative personnel of local authorities, it may often not be possible or may even be impracticable to carry out the complete and detailed statistical surveys known in more developed areas of the world. Therefore, sampling methods may be the appropriate statistical device for use in under-developed countries, also because their economic structure is often simpler and more homogeneous than in more developed countries. If complete statistics are available, sampling methods may be used to obtain data on total output in quantity and value which would permit measurement of aggregate gross output of agriculture, and to obtain various data on details, on which information is required if the net value of total output is to be established.

The following may be mentioned:

- (a) The yield per unit of area of various crops, or for other units if appropriate; and data needed to make crop forecasts;
- (b) On the number of cows, other cattle and poultry per farm;
- (c) On the average output of milk per cow, average output of eggs per hen etc.;
- (d) On the average net weight of cattle delivered for slaughtering and quantities of livestock by-products;
- (e) On the in-pur of fertilizers per unit of area, use of fodder, seeds, water for irrigation purposes etc.;
- (f) On agricultural labour force, by sex, age etc.;
- (g) Data on living conditions of the rural population.

In carrying out sample surveys every effort should be made to adapt inquiries to the characteristics of the economies of the under-developed countries. In many of these areas a large part of economic activity serves only the local population only and remains outside the monetary sphere. In such circumstances, activities in the families are usually inseparably mixed with activities which in more advanced economies would be reckoned in the productive sphere. It may be very difficult to measure these unproductive activities even approximately and to determine the prices at which they ought to be valued. These problems have been discussed in the literature on national income but actual statistical treatment has been very approximate in those cases where attempts at a measurement have

been made.^{1/} However, large-scale sample inquiries that have been carried out in some under-developed countries have shown that very valuable results may be obtained, which would undoubtedly be useful also for the purpose of measuring national income of those territories.^{2/}

Sample survey of income payments and profits in manufacturing industry

17. A proposal has recently been made in Sweden to obtain data on income payments and profits in various industries by means of sampling.^{3/} Since estimates of national income in Sweden as well as in other Scandinavian countries have to be derived from statistics of agricultural and industrial production and similar sources for other branches of industry, it has not been possible in general to compute the breakdown of national income by distributive shares (wages and salaries, interest, rent, profits etc.), which it is felt is very much needed, however, for various purposes of economic analysis. Taxation statistics in Sweden do not lend themselves for the purpose because fiscal income definitions differ too much from the economic income concept.

To obtain necessary basic data it has been proposed to carry out sampling inquiries among all industries, excluding agriculture, public administration, insurance and banking for which statistics may be derived from other sources. It has been suggested to use, for instance, the same classification of industries as was used in the last census of population.

A satisfactory basis for a representative sample cannot be obtained until the register of all enterprises has been established and completed. To make a beginning it is suggested to collect information from a sample of not more than 5,000 of the larger firms in manufacturing industry and commerce. At a later stage when more data may become available to be used as a basis for a more satisfactory sample, its coverage should be increased

1/ See V.K.R.V. Rao, The National Income of British India, 1931-1932, London, Macmillan, 1940.

Phyllis Deane, The Measurement of Colonial National Incomes, Occasional Papers XII, National Institute of Economic and Social Research, 1946.

Dr. J. J. Polak, "National Income of Indonesia 1921-1939," Statistical and Econometric Studies, vol. 2, no. 4, December 1947, pp. 104-108 (in Dutch).

"National Accounts of Indonesia," ibidem, vol. 3, no. 2, June 1948, pp. 61-75 (in Dutch).

2/ See Report on Living Standards of Plantation Workers in Java prior to the War, A/323/Add.3, 9 October 1947.

3/ Ekonomiska Utredningar Varen 1949, Meddelanden fran Konjunkturinstitutet, Series B:10, Stockholm 1949, pp. 133-146.

to 10,000 to 15,000 firms. Care will then be taken to obtain a representative distribution by sub-groups, based for example on the number of people employed in each industry.

The concept of profits as used in national income analysis does not necessarily coincide with the profits as shown in the accounts of the enterprises. Several adjustments may have to be made. Therefore, it is suggested to include in the questionnaire certain items which will provide the data necessary to make adjustments for conceptual discrepancies.

The questionnaire, which is appended to this paper, is presented in the form of an account of receipts and expenditure, because this facilitates checking of the information received and also because in this way the data may, at a later stage, be used to set up a system of social accounts derived from the accounts of the individual enterprises.

It is suggested to send out two sets of questionnaires, one for manufacturing industry and one for trade. Each questionnaire is set up in two ways, one to be used for unincorporated enterprises and a second to be used for corporations. The attached questionnaire has been proposed to be used for manufacturing industry.

APPENDIX

APPLICATION OF SAMPLING METHODS TO THE MEASUREMENT OF NATIONAL INCOME
PROPOSED QUESTIONNAIRE FOR MANUFACTURING INDUSTRY IN SWEDEN
Profit and Loss Account for the Year 19..^{1/}

Source: Ekonomiska Utredningar Våren 1949, p. 143.
(Economic Essays Spring 1949)

Note: Items marked B apply only to joint stock companies and other incorporated enterprises; those marked E apply exclusively to unincorporated enterprises. All other items refer to both incorporated and unincorporated enterprises.

Expenditures

1. Book value of stocks in the beginning of the year.
2. Purchases during the year of raw materials and other goods meant for the current production at current prices minus value of goods returned to the providers minus discounts.
3. Indirect taxes.^{2/}
4. Wages, etc.^{3/}
 - B. (a) Workers
 - (b) Entrepreneurs
 - (c) Others
 - E. (a) Cash
 - (b) In kind
5. Pensions, pension premiums and transfers to pension funds.^{4/}
 - a) Of which: transfers to pension funds.
6. Rent actually paid.
7. Interest.
8. B. Direct taxes.^{5/}
9. Insurance premiums, excluding pension premiums.
10. Depreciation of fixed capital.^{6/}
11. Estimated or actual loss because of bad debts.^{7/}
12. Extraordinary expenses (gifts, etc.).
13. Other operational costs (stamps, telephone, cleaning, etc.).
14. Transfers to investment funds.
15. Net profits according to this questionnaire.^{8/}
16. Total (equal to 26).

Revenue

17. Book value of stocks at the end of the year.

18. Gross operating income after deduction of discounts to customers.^{2/}
 - a) Of which: Remuneration in kind for employees.
19. E. Value of goods taken out for own use.
20. Value of production of fixed capital on own account.^{10/}
 - a) Of which: wages.
21. B. Dividends received on shares and other securities.
22. B. Interest.
23. Profits on sale of existing fixed capital (net).^{11/}
24. B. Net income of real estate.^{12/}
 - E. Eventual statement of accounts for real estate.^{12/}
25. Extraordinary income.
26. Total (equal to 1.6).

Information relating to Capital Formation

27. Purchases of fixed capital (net).^{13/}
 - a) Of which: site value.
28. Outlay for repairs and maintenance.
29. Estimated value of stocks at the end of the year at replacement value.^{14/}

Other Additional Information

30. B. Direct taxes paid during the year.
31. Net profits according to the company's accounts.
32. Distributed dividends.^{15/}

^{1/} Expenditures and income from operation of real estate other than that which is used directly as plant or offices of the enterprise are
 E. Excluded.
 B. Excluded from the special accounts and shown net under Item 24.

^{2/} Import duties should be shown under Item 3 (and not under Item 2) only to the extent the enterprise itself has imported the goods in question.

^{3/} Covers all wages including remuneration in kind. Commissions, etc., to other enterprises or entrepreneurs do not fall under this item but are included in Item 13. As remuneration in kind is reckoned also free dwelling.

^{4/} Includes only transfers which are used for pension purposes.

^{5/} Includes income taxes etc., with which the enterprise has been charged during the year according to its accounts. B.

- 6/ Includes expenditures on fixed capital purchased during the year and completely written off. These expenditures should, therefore, not be included under Item 2. As regards fixed capital for own use produced by the enterprise, see note 10/, Item 20.
- 7/ If the loss is estimated, an amount must be deducted for claims which have been written off, but are paid later on. The item may, therefore, be negative.
- 8/ Loss is indicated by a minus sign. Disposition of profits as transfer to pension funds or investment funds are included in Items 5 and 14 respectively.
- 9/ Includes commissions, royalties and goods produced in the enterprise transferred to the employees as remuneration in kind.
- 10/ If expenditures for production of fixed capital for own use are included on the expenditure side, a corresponding amount must be added as revenue.
- 11/ Loss is included as a negative item. The total may, therefore, be negative.
- 12/ Real estate should be classified in the same way as in the declaration to the tax authorities. Expenditures should be shown gross only for real estate used in the enterprise itself. Item 24 should show the balance on profit and loss account for other real estate. If the net balance cannot be shown without difficulty, gross figures may be given (gross income should be designated by BR). The result of the operation of agricultural and forest real estate must under all circumstances be shown net. If dwellings in buildings owned by the enterprise are used free of charge by employees, the estimated value of this remuneration in kind should be reckoned as income under Item 24. B.

If the accounts showing the operational result of other real estate belonging to the enterprise are consolidated with the operation account of the enterprise proper, and it is very difficult to separate these accounts, the operation of other real estate may be shown gross on the questionnaire. Item 24 should in that case show the gross income of other real estate and should also include the value of free dwellings for the employees. The results of the operation of agricultural and forest real estate must, however, not be shown in the questionnaire. E.
- 13/ This item should show the expenditures on fixed capital minus income from sales of already existing real capital. It should include also expenditure on production of fixed capital on own account.
- 14/ Actual price at the end of the year should be used for estimation of the value of the stocks. The first time an enterprise gives information about this point, the following additional information about stocks should be given:

 - (a) Stocks at the beginning of the year.
 - (b) Stocks at the end of the year, both evaluated at replacement value at the time the evaluation takes place.
- 15/ Dividends paid out during the calendar year for which the questionnaire is meant. They therefore refer to the profits of the preceding year. B.