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4 THE INTEGRATION OF NATIONAL INCOME ACCOUNTS WITH OTHER ECONOMIC ACCOUNTS AND RELATED DATA

Introduction

The evolution of economic accounting since World War II has made it evident that for many purposes the data contained in the national income accounts are too summary and consolidated. The development of other forms of economic accounts such as input-output, moneyflows, balance of payments, and program budgeting has for the most part occurred outside the national income accounting framework. It has become increasingly evident to all concerned that an integration of all economic accounting systems dealing with related sets of transactions is essential, from the standpoint both of those generating the data and of those who wish to use it for economic analysis. The implementation of a large economic accounting system for a nation requires substantial resources, i.e., numerous statistical sources, specialized manpower, and computer facilities. Insofar as the various economic accounting systems deal with the same sets of data there should be considerable economy in developing all of the required estimates simultaneously. Decentralization of the task of estimation often results in duplication of effort, and inconsistency or noncomparability among similar parts of the related systems; from an analytic viewpoint, it confronts users with apparently conflicting sets of data, with no way to bridge the gap except through elaborate reconciliation tables that explain the conceptual and statistical differences.

In addition to the data contained in the formal economic accounts, supplementary and related sets of economic data are needed, such as further breakdowns of the major economic constructs, and prices or

62 DESIGN OF ECONOMIC ACCOUNTS

deflated value data that can be directly related to the economic accounts. The accounting system and the related economic data, furthermore, must be designed so that they can be directly related to social and demographic information. With the increasing amount of information required by different users, such as regulatory agencies, states, urban communities, and other groups concerned with special economic and social problems, the task of bringing system and order to the masses of information developed becomes more difficult, and the need becomes more pressing. Unless this can be done simply and easily it will not be possible to evaluate the operation of the economic system in terms of social goals, to analyze the impact of social change, or to examine proposed social policy in terms of the behavior of the economic system. In other words, the integration of the economic accounts with other economic, social, and demographic information is essential if we are to relate the operation of the economic system to the development of the society itself.

The integration of information systems depends in a fundamental sense upon the set of basic classification systems employed. Classification systems, like economic constructs, represent a method of grouping blocks of information having certain characteristics in common. As the social and economic systems change, so must the classification systems. For example, the industrial classification system of the twentieth century is quite different from that of a century earlier. The analytic models that are developed to study specific problems will in large measure determine the nature of the classification systems that are needed. Changes in knowledge and in theoretical approach will, therefore, also have major repercussions upon classification systems. However, the basic classification systems show substantial stability, and only change gradually over time. Those concerned with the design of classification systems must balance the need for new information against the need to provide continuity over time.

In this context, it is useful to examine the US and the new UN systems of national economic accounts to see to what extent they provide the basis for an integrated system of economic and social information. One of the outstanding characteristics of the US system is continual expansion of the amount of information provided, so that today it represents one of the most comprehensive sets of economic information available anywhere. The new revision of the UN system also has as a major objective the development of a framework into which the major forms

of economic accounts can be integrated and which can provide the required basic information about the operation of the economic system.

The Integration of Economic Accounts

Over the last decade a consensus has been developing about the preferred method of integrating the various forms of national economic accounts. When the UN system was first adopted, this problem had not yet arisen. However, with the further development of data for the analysis of interindustry relations, financial transactions, economic planning, government budgeting, and the balance of payments, many countries and international organizations have become deeply concerned with the problem.

In the 1958 revision of the US national income accounts, the Department of Commerce seriously considered how the national income accounts could be integrated with other forms of economic accounting in the future. It was noted that the national income accounts could be deconsolidated to provide a framework for input-output tables and for financial transactions accounts. The subsequent work on input-output by the Office of Business Economics has followed this approach, and more recently the Federal Reserve Board has integrated the flow-of-funds accounts with the national income accounts. A general outline of a possible system of deconsolidation that would provide integration of all economic accounts (including national wealth and balance sheets) was presented in the National Accounts Review Committee Report [17], which appeared in 1958.

The new UN system also uses the principle of deconsolidation of the four summary accounts for the nation as a whole to provide a set of national economic accounts covering input-output and financial transactions, and to suggest a blueprint for the later integration of national wealth and balance sheets. Actually, the new UN revision presents not so much a system of national income accounts as such but rather a set of more general economic accounts that, with further deconsolidation, can present the additional sets of information required for different kinds of economic analysis.

The process of deconsolidation involves the development of classification systems that can provide the kind of information required. Each different form of economic accounts has its own classification requirements. Some of the types of classification systems will be very different,

e.g., input-output tables and financial accounts, but similar classification systems may be used for related forms of economic accounts. Thus, for example, the classification used for input-output should be directly related to that for capital formation accounts, and the classification used for financial transactions, to that for balance sheets. An examination of each of the forms of economic accounts will indicate the types of classification systems that are required and how they are related to the problem of providing for an integrated set of economic accounts.

Input-Output Tables

Input-output tables are a deconsolidation of the income and product accounts of the nation. They show the value of products produced by specific industries in terms of (a) their inputs from other industries and their use of factors of production, and (b) their sales to other industries and to various final users. Since the focus of interest in these tables is on the technological relationships of the production and the demand for specific commodities, the industry and commodity classifications involved are developed to provide as much homogeneity as possible for both production and demand considerations. But there is a conflict between these two criteria. To analyze demand, industries should be specified in terms of homogeneous sets of commodities, without regard to whether they are produced by the same or different establishments. To analyze production functions, however, it is desirable to view the production process as taking place within specific productive establishments, each of which has a labor force, plant, and equipment, and may produce a variety of different commodities that from a demand standpoint might be classed in different industries. For this purpose, the industry classification of the establishment is based upon the general type of industrial activity in which it is engaged. The majority of input-output tables attempt to reconcile these conflicting criteria as best they can, but generally they provide information on an establishment basis.

As already indicated, the Office of Business Economics has published an input-output table that represents a deconsolidation of the national income and product account. However, this table does not represent a complete integration of input-output with the national income accounts, since the classification of industries in the two systems differs somewhat. Both industry classifications are based on the United States

Standard Industrial Classification System, but they differ in coverage. For example, the input-output table presents considerably more detailed classifications for manufacturing and less detail for the service industries. It, therefore, becomes difficult to relate the input-output data to the data on income originating by industry.

In the new UN revision, the input-output table is separated into two tables. The first shows the supply of commodities by establishments in the different industries and the use of these commodities. The second shows the use of commodities and the factors of production by establishments in different industries. Since the same commodity and industry classification systems are specified for input-output data and for the income and product accounts, the new UN system would result in full integration between these accounts.

Financial Transactions

In the United States, the flow-of-funds data provided by the Federal Reserve Board are now directly related to the national income and product accounts. The same major economic constructs, such as gross national product, gross domestic investment, personal income, consumer expenditures, and government expenditures, appear in the flow-of-funds accounts and in the national income accounts, in precisely the same form and with precisely the same values. Additional economic constructs such as gross national saving, gross national investment, and gross personal saving that are introduced by the flow-of-funds system are systematically related to the other constructs in the accounts. Basically, the flow-of-funds statistics show the sources and uses of funds by sectors and subsectors of the economy. The sectoring must, of course, be of an institutional nature, since those involved in financial transactions must by definition exist as legal entities. The integration of the detailed sectoring of the flow-of-funds data and the income and product data is not complete. Although the institutional subsectors of the two systems are directly related, they differ substantially in the amount of detail they provide. In the flow-of-funds subsectoring, particular attention is given to financial institutions; in the subsectoring of the national income accounts, the corporate and noncorporate sectors are broken down into broad industrial groups. More comparable subsectoring of the two systems would be desirable so that data showing the impact of financial

institutions on the functioning of the economy and the financing of capital formation by major industrial sectors could be more fully presented.

The new UN revision includes income and outlay and capital finance accounts for each of the institutional sectors in the economy. These two accounts together provide the same information as the sources and uses sector of the Federal Reserve Board's flow-of-funds accounts. The capital finance account is further broken into two parts, one showing gross investment and its financing, and the other showing the net acquisition of financial assets and the related net incurrence of liabilities plus net lending. In essence, aside from the question of institutional sectoring, the new UN system adopts the same conceptual approach to integration as the US flow-of-funds.

Other Forms of Economic Accounts

The integration of other forms of economic accounts is less developed because generally they have not been as clearly formulated as either input-output or flow-of-funds. It seems clear, however, that national wealth accounts and balance sheets must be directly related to the changes in assets and liabilities information in the financial transactions accounts. This is recognized explicitly in the financial asset and liability accounts that the Federal Reserve Board provides for the US, and it is also shown in the extended matrix presentation in the new revision of the UN accounts. However, there are still major problems with both tangible and intangible capital assets and national wealth.

Efforts have also been made to integrate the national income accounts and government budgets in the United States. On the one hand, program categories have been introduced into the classification of government outlays in the national income accounts, and on the other, there has been considerable progress in changing the basis of government budgeting to the concepts used for national income accounting. The new UN revision explicitly provides for a breakdown of government outlays by purpose as well as by type of transaction. Further development of program and project budgeting and further deconsolidation of the national income accounts into institutional as well as program categories will provide a better integration of government budgets and national income accounts.

Finally, balance of payments accounts are closely related to the external transactions account in the national income accounts. However, to use the balance of payments to make projections for the future or to understand what has taken place in the past, it is not only necessary to integrate the foreign transactions account with the national income accounts, but also to show data for the rest of the world explicitly in the deconsolidations of other accounts. For example, the input-output table must show the relationship of imports and exports to the domestic supply and use of goods and services. The rest of the world also needs to be treated as a subsector of the economy in the financial transactions accounts, and for certain types of assets and liabilities, domestic assets need to be distinguished from foreign assets. In other words, the national economic accounts must show how foreign transactions relate to the operation of domestic sectors, and in the majority of cases it is useful to show the gross foreign transactions taking place rather than just the net changes. The foreign transactions account itself requires further deconsolidation to show relationships with different areas of the world and countries. Because of the role of specific international financial institutions (e.g., the International Monetary Fund and the World Bank) and special kinds of transactions (e.g., special loans or grants), the classification system here may be somewhat different from that provided in the domestic financial transactions account.

Integration With Related Economic and Social Data

The formal national economic accounts are the systematic presentation of data on transactions (actual and imputed) for the national economy. For many kinds of analysis, however, such data are not sufficient. The rather highly developed and articulated system of national economic accounting must be related in operational terms to other forms of economic and social data, such as prices, quantities of output, regional data, and social and demographic characteristics.

Integration of related economic data involves further elaboration of the device already used to integrate the national economic accounts. Specifically, the technique of deconsolidation and disaggregation of major economic constructs and summary economic accounts can provide the basis for developing related information at the different levels of aggregation.

Constant Price Data and Price Indexes

Since the system of national economic accounts reports transactions data, the major economic constructs are measured in terms of the actual prices at which they take place. A time series of the major economic constructs relating to output will therefore reflect both changes in prices and changes in quantity. The economist wishing to analyze the behavior of the economic system is very much concerned with separating the price change from the quantity change. As a consequence, almost every country that provides national income accounts also provides some of this information in the prices of a fixed base year so that quantity changes can be isolated.

The usual constant price data are for expenditure on gross national or gross domestic product at market prices. This breakdown purports to show the changes in real personal consumption, real public expenditures, and real capital formation. The constant price data are obtained by deflating the current expenditure data for specific goods and services by appropriate price indexes, or in some cases by using direct quantity measures for the changes in particular categories of goods and services. It is generally recognized that the measurement of expenditures at constant prices is a difficult problem, however. New products are introduced and old products undergo quality changes that cannot be measured. In the case of some services, e.g., those provided by many government employees, it is not possible to measure the quantity of output, so that input, measured in terms of the number of employees or hours of work, must be used as a substitute. As a result, for many sectors the constant price data reflect inputs, imperfectly measured, rather than outputs.

Output can also be measured in terms of the industries in which it originates. For this purpose it is usually desirable to deflate both the cost of goods and services that a given industry purchases from other industries, on the one hand, and the sales made by the industry, on the other. This double deflation method requires knowledge of the inputs into each industry and their prices, as well as the prices of each industry's output. In other words, the double deflation method must be carried out at a disaggregated level on the basis of input-output relations.

The problem of integrating price information into the national accounts is discussed at some length in the new revision of the UN system. It notes that the use of different bases (Laspeyres and Paasche) for price information results in different measurements, and that the

specific formulation of the price index also is a matter of some concern. It also discusses the possibility of extending price index measurements over space as well as over time, deriving quantitative differences in the level of output by industry and by type of good among different countries. The problems here are even more formidable than those of comparisons over time, however, and the task of providing consistent and reliable price measurement encounters serious difficulty where there are wide differences in the patterns of consumption and in technology.

Since price index data are useful only to the extent that they can be related to existing economic constructs, national economic accounts provide a framework into which price information can be classified; in fact, most countries provide supplementary data tables showing the implicit price measurements that result from dividing the computed constant price data into the current price data. Such concepts as the wholesale price index or in many countries even the consumer price index do not have much conceptual validity if they are constructed outside of the national economic accounting framework. Often, for example, the wholesale price index is composed of a collection of miscellaneous items weighted in an impressionistic manner, so that the index has little economic significance; or the consumer price index may refer to a market basket of goods that is not relevant to any actual social or economic group of consumers.

Further Breakdowns of Economic Constructs

For many purposes the accounts for the nation as a whole provide information that is too aggregative to be useful. If, for example, one wishes to examine what is occurring within one region of the economy, or to compare the development in one region with that of others, the aggregative national accounts do not help. To the extent that the national economic accounts are built up on the basis of data gathered regionally, such as income tax data, social security data, economic census data, and data from regulatory agencies, regional information can be developed fairly easily from the national data. A considerable duplication of effort would be involved if each region tried to develop its own economic accounting data. Furthermore, if regional accounting data are not derived as breakdowns of the general national economic accounts, analysis of regional behavior cannot be analytically related to the operation of the national economy as a whole. In some cases, the national economic

accounts do not provide sufficient detail for regional breakdowns, or do not contain the kind of information required, e.g., trade between regions. In these cases, data outside the national economic accounting system may have to be obtained, either on a sample basis or from other statistical sources. In order to provide a unified economic accounting system, however, such information must be tied directly to the regional breakdowns of the economic constructs provided at the national level.

Beside regional breakdowns, other kinds of breakdowns may also be needed. For example, there is considerable interest in the size distribution of income of households and individuals. To be analytically useful, the size distribution of income must also be fitted into the constructs of the national economic accounts relating to the household sector. The size distribution of income should be viewed as a tabulation of personal or disposable income by size class; other statistical sources may be required to generate such data, but the over-all context within which the data are developed should be consistent with the constructs and definitions of the national economic accounts.

For other major kinds of data, such as that relating to capital formation or government transfer payments, special breakdowns that provide additional information will be required. In such cases, deconsolidation and disaggregation are again employed so that the additional information fits within the general framework of the economic accounts.

The development of extensive breakdowns providing masses of information for regions, industries, subsectors, size classes, etc., has resulted in the publication of a tremendous volume of detailed data, but additional cross tabulations and more detailed breakdowns are still needed for specific purposes. On the other hand much of the mass of published detail is valuable only as reference material. Quantitative work involving the further processing or analysis of large amounts of published data requires that such data be put into machine readable form for the computer. In recent years, however, the published data themselves are the product of computer processing, and in many instances may even be direct computer printouts. In these cases, a considerable extra cost is involved if the data are published in printed form and the user must then put them back into machine readable form. Government agencies have recognized that the provision of machine readable information directly to users may in many instances be more satisfactory than publication of highly detailed data in printed form. As the detail and complexity of the data provided by the information system increases,

the alternative of supplying specialized data in machine readable form will become more compelling. Those engaged in the study of regional economic development, for example, will want complete machine readable sets of data relating to particular regions. Similarly, in the case of an input-output table, the publication of a large matrix of 200 by 200 industries does not provide data that are particularly useful or manageable; a computer tape containing the basic input-output data is much more useful to those engaged in such analysis. Even the flow-of-funds data on financial transactions published at the level of greatest detail on a quarterly basis find relatively little use, but this same data in machine readable form can be used for a wide variety of analyses.

Published data should be in two categories: first, summary presentations leading to a broad understanding of the structure or behavior of the major elements that are being portrayed; and second, detailed listings of reference type data. Thus, for example, the *City and County Data Book* provides a number of pieces of economic and social information that those interested in a specific community can consult. In this particular instance, any one individual may be concerned with only a small part of the total data structure, but presumably there are enough individuals interested in different parts so that the publication of such reference data is useful.

The Integration of Social Data

To some degree social data are implicit in the structure of the national economic accounts. The distinction between households, governments, and enterprises is social as well as economic. The breakdown of transactions by type is often based on the social rather than the economic characteristics of the transaction, and the designation of regions and cities introduces further information of a nontransaction nature. Within the national economic accounts, social data are most relevant to the household sector. Here it would be useful to provide groupings of households not only by economic characteristics, such as the size of income, but also by social characteristics. Thus it is possible to distinguish individuals on the basis of race, age, education, and sex, and to discuss the character of a household in terms of the composition of the social characteristics of its members. Tabulations and cross-tabulations of the social characteristics of households, e.g., retired population, racial groups, education levels, family size, etc., can be provided. But this

approach, if carried to the length which is in fact required for social and economic analysis, tends to be self-defeating. Dividing data into more and more cells by cross-classification soon reaches the point where the number of cells greatly exceeds the number of possible observations. Thus, for example, a consideration of households in each community in the United States by the characteristics of each of the households can rapidly lead to tabulations in which the number of cells exceeds the number of households in the United States. From an analytic point of view such a result is obvious, since the full set of characteristics for each household is in some real sense unique. In the past, attempts to resolve this problem have resulted in the production of a few summary tabulations that shed light on some problems but are quite inadequate for a wide range of other problems. A proper cross-tabulation for one purpose is often useless for other purposes.

A more promising method of integrating economic and social data is the creation of special sets of microdata. For many sets of aggregate data it is possible to establish a representative sample of individual reporting units showing the microdata on which the aggregates are based. For example, for the household sector of the economy it should be possible to construct a sample of households such that the total of the incomes of all households, weighted by the appropriate sample weights, would be equal to the total personal income for the economy as a whole. If the sample is representative, a distribution of the individuals in it by occupation and industry would yield the employee compensation paid by industry. Similarly, a distribution of the sample by size of income would yield the size distribution for the personal income sector as a whole. If the reporting unit in the sample is the household, demographic and social information about each household can be included. The composition of the household in terms of age and sex, education, occupation, and work status of each member can be provided, as well as what is essentially the household's complete income statement and balance sheet indicating such things as the nature and amount of income received, expenditures and saving, home ownership, possession of durables, etc.

An initial start in this direction has been made by the Bureau of the Census in their 1-in-1,000 sample of the US population. This sample contains information on approximately 100,000 households, and contains over 40 items of information for each household. The existence of a large sample of the household sector not only permits special purpose cross-tabulations to be made, but it also provides the basis for

analyses involving simulation of household behavior. It is possible, for example, to extract from the household sample a specific group of households and examine through the process of simulation precisely how they and their behavior might be expected to change over time, under certain assumptions and in accordance with the past behavior of similar households. An example of such a simulation using the 1-in-1,000 sample of the population was carried out by James Schulz in order to investigate the economic circumstances of the aged in the year 1980 [26]. He developed a stochastic life process model that provided for the sequential aging of those members of the US population who were 40 years and older in 1960. The model involved applying mortality data, information on job turnover, ownership of private insurance, coverage by private pension plans, and eligibility for social security to individuals according to their characteristics. In applying mortality data, for example, the probability of a specific individual's death was based on the age, sex, and race of that individual, and whether the death actually occurred was determined by this probability and by the generation of a random number. Thus, if the probability of death for a specific individual was determined to be 4 chances in 1,000, a random number from 1 to 1,000 was generated, and if this happened to be 4 or less, a death was considered to take place. By applying this method of generating changes, a complete life process model was simulated for each individual in the sample for a twenty year period, bringing the time period up to 1980. A census of the sample was taken as of that date to determine the distribution of income and the economic circumstances of the aged. The major purpose of the simulation was not to provide a forecast or projection as such, but rather to test the sensitivity of the simulation to various changes in policy variables or structural shifts that might occur over the next 20 years.

The use of microdata relating to a sector or subsector of the economic accounts is not necessarily confined to simulations using demographic and social data. Joseph Pechman has used a microdata set of 100,000 tax returns, which represents a sample of those individuals who are subject to income tax, for analyzing the direct effects of changes in the income tax law [27]. In this type of analysis the individual tax returns for each taxpayer in the sample are processed under the various alternative tax regulations. An analysis of the differences that would result from the various regulations in terms of the total tax yield and the relative burden on different groups of taxpayers is then possible.

Other samples of microdata have been developed by private organizations. For example, Standard and Poor currently produces computer tapes containing quarterly financial reports of many of the major firms in the United States [28]. A wide variety of survey material is collected by both academic and commercial institutions. For the future integration of economic and social data it is important that on the one hand the national economic accounts be designed so that they can be implemented for certain sectors at the sample survey level, and that on the other hand those collecting sample survey information be encouraged to do so within a proper sampling frame and in a manner such that it can be directly related to the more general framework of economic and social information for the nation as a whole.

The Role of the Computer

The development of the computer in the last decade has made the processing of masses of information possible. Within the next decade it can serve as the basis for integrating economic and social data. Basic to such an integration, however, is the underlying framework of economic accounts and standardized classification systems for both economic and social data. The information system must be capable of yielding at the same time major economic constructs aggregated for the system as a whole, and highly disaggregated basic data. In particular, given the computer, it becomes feasible both to create and to use microdata sets which form representative samples of parts of the economic system and of society. The generation of the underlying disaggregated data and microdata sets is not difficult. The operation of many agencies of the government generates such information automatically. The Internal Revenue Service, the Social Security System, Motor Vehicle Registration Bureaus, and a multitude of other governmental operations automatically provide masses of information that can be utilized directly to provide the basis of the statistical system.

There is, however, a major problem of privacy and disclosure. In part, this problem has already been faced by governments in the collection of census information on individuals and establishments and records on crime and health. Before the advent of the computer, the major safeguard to privacy was the inability of the system to handle and process information and to collate information from different sources. Some federal agencies have been aware of the problem of confidentiality, and

have refused to disclose their records even to other agencies or other parts of the government. Thus, for example, the Bureau of the Census is protected from having to disclose any of its records to Congress, and does not even provide to the Internal Revenue the names of individuals or companies from whom it obtains information. Archives has a long record of sequestering specific documents from the public and certain classes of documents from government agencies. Other operating agencies have not been as concerned with confidentiality of data, however. Security agencies have been able to obtain a wide variety of records from both public and private sources about the activities of individuals and companies, and people are naturally somewhat uneasy that a central statistical system containing individual data might be used against them.

Such fears seem entirely justified, and indicate the need for developing a system of safeguards. The entire problem of confidentiality of all data obtained by the government and by major private organizations such as credit agencies, major employers, hospitals, educational institutions, etc., needs to be considered explicitly. In many cases, the information collected by certain groups, public or private, may be considered improper and not in the public interest, and in other cases provisions should be made for specific safeguards. The development of safeguards of information is not new. The confidentiality of communication between a patient and his doctor or a lawyer and his client is protected to the extent that the courts cannot have access to it. The outlawing of certain types of reporting and eavesdropping is also being recognized.

The desire to provide against the abuse of data, however, should not go so far that data important for the analysis of economic and social policy are not collected or preserved. Social and economic information is essential in evaluating the effect of specific policies. For example, major questions of the desirability of urban redevelopment, the extension of equal opportunity, or alternative forms of education are all matters of national concern. Unless information is available for appraising such questions, those responsible for the design and implementation of policy will have no basis for judgment, and the social scientist cannot carry out an effective program of research.

The computer can help make possible the analysis of highly disaggregated and microdata while at the same time insuring confidentiality. In the majority of cases, the social scientist can request a specific form of data processing and ask the computer not for the individual data but for the results of the analysis. From the analyst's viewpoint, this is

desirable and efficient, since by drawing on a central data file of highly disaggregated information he can obtain access to information in machine readable form without having to handle or process the information himself. Remote consoles will enable individual users to use central data files directly, and the confidentiality safeguards can be programmed into the system so that no information of a confidential nature will be released to any user. Specific operating agencies, of course, must have authorized access to certain kinds of information. The police, for example, should have access to information on what automobile license numbers are related to what owners—information to which, of course, they currently do have access. Merely because one group has access to certain information does not mean that others must or should have similar access. The question of who is authorized to have access to what information is a matter of major political concern that should be considered explicitly agency by agency, and should not be left to chance—or inefficiency.