RECONCILIATION PROBLEMS AMONG THE SOCIAL ACCOUNTS[1]

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Social accounting data are prepared by a number of different producers or sources. Seemingly like categories of data have different transactions or transactor content. Consumers of such data are confronted with reconciliation problems. For example, the sum of all the items of government expenditure presently in the Bureau of the Census type accounts does not equal total government expenditure for a like period as reported in the financial records of governments. Nor would the sum of all government expenditures equal the total as estimated by the National Income Division of the U.S. Department of Commerce. As transactors and transactions contained in one social account system are treated differently in another, we may anticipate different cyclical or trend patterns in the series due solely to the preparation of the facts. If the intention is to prepare analyses of the data, the results are partly dependent upon data preparation practices. This is an uncomfortable fact.

This study presents a method of distinguishing classes of reconciliation problems, and a description of the data preparation practices which lead to such problems.

A narrow definition of a reconciliation problem is adopted. Reconciliation is required whenever two or more producers of social accounting data follow different rules for the treatment of single transactions between parties or actors. Such rules cover the inclusion or non-exclusion of certain types of transactions in the accounts. They also include the assignment of individual actors to larger groups, and the assignment of a transaction to a time period. Apparently comparable categories have revealed differences of five to ten per cent or more.[2] Also, cyclical variation in this percentage appears discernible.

It is tempting to resolve this pervasive, and frequently irritating problem by a decision to utilize only one source. But the situation with respect to the different social accounts is that each major source of social accounting data yields unique detail, or covers a unique period of time, or yields unique groupings of actors. Each provides information not currently available in the others. It could be argued that reconciliation problems are a consequence of the varying goals of the producers of social accounting data. The main point of the discussion is that difficult and sometimes intractable reconciliation problems could be eased if social accounting data were presented so that consumers of data could make the adjustments.

Common Features of Social Account Systems

It will be desirable to marshall some of the distinguishing features of social accounts which are common to all the systems to be examined before we set out the data preparation practices which separate them. These features explain in good part the rapid growth of social accounting information, and the increasing use of such data to describe the roles of actors in an interdependent economy. It will be recalled that if each party to a transaction reckoned in money units maintains a double-entry system, the transaction may be made to yield six entries--two for the social accounts. Also useful information about the circumstances of the exchange may be obtained. The minimum two entries on the books of each party yield information about the functional area in which the transaction took place (e.g., in the case of local government units, transactions in the areas of education, recreation, etc. could be distinguished); the type of account (operating, income, or wealth); and the object of the transaction (consumption goods and services, labor service, raw material, equipment, etc.). For the economy as a whole, we obtain an entry classifiable as an "incoming" (receipt, revenue) for one transactor, and an "outgoing" entry (expenditure) for the other. These transactions may be prepared so as

a) to reveal the identity of parties to transactions,
b) to reveal the circumstances of the transaction such as the function, account, and object,
c) to yield a balanced system; i.e., a complete presentation of flow items and consequent changes in stock items,
d) to yield consistent sub-totals and totals (as happens in the case of data prepared by one source, but not among the various sources of social accounting data as we shall see).

Although individual unit accounts, budgets, financial records, profit and loss statements and balance sheets remain the conceptual primary source of data (even if actors such as households do not keep them), it may be more efficient to obtain data on transactions from tax returns, social security account transactions, industry sales records, etc. For our purposes, it is easier and sufficiently accurate to think of the individual account and transaction undergoing processing.

Data Preparation Decisions

Producers of social accounting data must make a number of important decisions about

the treatment of transactors and transactions. Various kinds of agents or units in the economy can be distinguished such as consumers, businesses, government units, and others. A decision must be made about grouping individual transactors in one category or another, or to exclude them from the accounts. We single out one of these decisions to illustrate the consequences of two major sources deciding differently in one instance. The Bureau of the Census statisticians sharply distinguish government units from other units while the income and product account statisticians group government enterprise transactions with private enterprise.

Another group of decisions concern the type of transactions. Should all transactions be included, making the system a record of actual transactions, or should some transactions be discarded? For example, in the preparation of input-output tables, a decision must be made as to the inclusion of transactions in existing assets and financial claims. Input-output statisticians do not include them and concentrate on newly produced commodities. U.S. Bureau of the Census statisticians do include them in their reports on government revenues and expenditures. The Federal cash budget as well as the accounts of businesses and households include such items. The treatment of capital account transactions is one of the most delicate decisions, and problems confronting the social accounting statistician. Newly produced capital commodities enter into input-output tables and income and product data. Other capital account transactions are presented in flow of funds accounts. Reconciliation is possible if such distinctions are maintained.

Input-output statisticians make efforts to retain information on parties to transactions by industry, whereas in the other systems such direct information is not maintained. Social accounting statisticians must decide whether or not to group transactions by calendar year or by fiscal year. A similar problem arises when decisions are made to group transactions on a cash or accrual basis over time. In the case of the national income and product accounts, the record of actual transactions is altered by the preparation of imputations of the value of commodities not purchased. Examples are the estimates of food grown by farm households for their own use and the value of goods and services provided by the military establishment for personnel. These imputations create a discrepancy between the income and product accounts and other systems. It will be useful to present these differences in a more explicit manner.

The Transactions Matrix Approach to the Problem

We propose a sharper attempt to cut through the thicket of problems of reconciling social accounting data. The tool for this effort is a formal scheme, a transactions matrix with associated grouping matrices. We seek gains in treating systematically the issues described previously. The cost lies in the fact that it is a more roundabout method.

A transactions matrix, (t_{ij}), is introduced which depicts individual actor or unit exchanges reckoned in money. By convention, columns of entries assigned to an actor will be understood to reveal outgoing or expenditure transactions while rows of entries reveal incomings or revenue (or receipts) of actors. Sometimes this arrangement is referred to in terms of "purchases from" (columns) and "sales to" (rows). However, transfer transactions, subsidies and intergovernmental transactions are of interest. We shall adopt the view, therefore, that places a value upon completeness of description of transactions above all else. We want (t_{ij}) to contain what actually happens, not what we think ought to happen.

Each exchange produces an outgoing entry in a column which when located identifies the party for whom it is an incoming. There is no need to be inhibited at this stage by limitation of data processing equipment. The dimensions of the underlying transactions matrix can be thought of as being equal to the number of households, business, non-profit units, federal, state, and local government units of all kinds, public authorities, corporations, trust funds, agencies, commissions, etc. Transactors may be further identified by size, regional location, or other characteristics. Such identification would permit consolidation at a later stage into various groups which are thought to be homogeneous. The dimensions of the matrix are now further expanded so as to permit transactions to be classified as to function, account, and object. Revenue rows may be expanded so as to distinguish type of revenue or income (tax source, labor or property income, etc.). These define some of the possibilities.

Clearly, present data processing equipment does not permit us to deal with a transactions matrix of dimension even close to the one we have sketched. Simplification is required.

Processing operations in which transactors and transactions are grouped or eliminated find their analogue in grouping matrices A for rows and B for columns with which we can operate upon matrix T. These operations may be represented succinctly:

$$1) \quad \sum_j \sum_k a_{ij} \; t_{jk} \; b_{kl} = (r_{il}),$$

where a, t, and b indicate elements in matrices. If we think of the indices as running $j = 1,\ldots,$ J and $k = 1,\ldots,$ K, then $J > I$ and $K > L$. Grouping matrices are defined to contain as elements either 0 or 1. They may facilitate, conceptually, our systematic treatment of the processes of preparation of varied social accounting data. The grouping matrix with which we pre-multiply T will either consolidate row entries or send them to zero. The post-multiplication matrix will operate upon columns of T in like manner. The fact that we reduce T to more manageable size is a striking advantage but not without its costs. Not only will consistency problems arise among sources, but also aggregation problems may be revealed by this approach.

Operations with grouping matrices may be classified logically and associated with current practices. If A and B are identity matrices, we reproduce the entries of T in R. If A and B are row and column vectors, respectively, each element of which is 1, we reduce all transactions to a scalar. These are the extremes.

It is apparent that we may group actors with respect to expenditures by strings of 1's in rows of A, and we may group actors with respect to receipts by strings of 1's in columns of B. Rows and columns may be rearranged in the transactions matrix by rearranging the rows or columns of the grouping matrices in their identity form. Transaction entries will be washed out wherever zeros are found in the grouping matrices--an important operation. In instances in which the grouping matrices are vectors, the existence of zeros annihilates information. This important example is worth a simple illustration:

$$(1\ 1\ 1)\begin{pmatrix}0 & 4 & 2\\ 2 & 0 & 1\\ 1 & 3 & 0\end{pmatrix}\begin{pmatrix}1\\ 0\\ 1\end{pmatrix} = (6).$$

Processing operations may be classified so as to correspond to operations executed by grouping matrices:

a) Transactors may be grouped in varying degrees (reduction in the dimension of T).
b) Government transactors may be grouped with private actors (if all government actors were initially placed side by side, the operation may be thought of as an interchange of rows or columns which places a government actor among private businesses, for example. The operation is carried out conceptually by interchanging the rows or columns of a grouping matrix).
c) The extent of direct information as to the identity of both parties may be reduced--and extinguished in the cases in which R is a vector, or scalar.
d) Transactions may be grouped (loss of detail as to function, character, or object represented by a further reduction in the dimensions of T).
e) Transactions may be sent to zero (by $a_{ij} = b_{kl} = 0$).
f) The underlying transactions matrix may be torn apart to make room for alterations such as imputed expenditures or revenues (no grouping matrix analogue).
g) Transactions may be netted to a scalar for one actor; i.e.,

$$\left(\sum_j a_{ij} - \sum_i a_{ij} = r\right).$$

h) The underlying transactions matrix may be altered in its time dimension so as to convert it from a fiscal to calendar basis, or from a cash to an accrual basis.

Differences in the preparation of data by sources may be portrayed by constructing grouping matrices which correspond to their practices. Grouping matrices may then be compared, and any difference in elements along any row or column, or any interchange of rows or columns will result in a reconciliation problem. Differences in dimensions need not lead to such problems, although it will rarely be possible to reverse the degree of consolidation of series without, for example, inspection of worksheets. Whenever the grouping matrices are vectors, direct information as to the identity of the parties is lost.

This survey of logical possibilities is more than an exercise. The intention is to show that social accounting data as currently prepared may be conceptually derived by grouping operations from a common, underlying transactions matrix.

Derivation of Some Contemporary Social Accounts

Consider the derivation of budget information such as general fund transactions for local government units, or the federal administrative budget. The first step in our program is to partition T so that all transactions among actors of no interest to us at the moment are sent to zero. We may think of this activity as preparing another matrix whose elements are matrices, only one of which is of interest to us. Expenditure transactions of the government unit are reduced to a vector. In the government matrix element the grouping matrices appear as follows

$$A = (11\ldots1)$$

$$\text{and } B = \begin{pmatrix}1 & 1 & \ldots & 1\\ 0 & & & 0\\ & & & \\ \cdot & & & \cdot\\ \cdot & & & \cdot\\ \cdot & & & \cdot\\ 0 & \cdot & \cdot & 0\end{pmatrix}$$

We obtain R as a vector of budget expenditures by function, department, or character. If the dimensions of T are N by M, then A is 1 x N, and B is M by P. A vector of revenue transactions may be obtained by interchanging the roles of A and B. These data differ from those presented in financial reports (such as Treasury Statements) in that special fund, trust fund, and government sponsored enterprise transactions are not customarily included in administrative budgets. By expanding the row or column dimensions of the grouping matrices we may obtain the "cash budget" which includes these remaining transactions.

The landscape becomes much more obscure when we consider the important income and product accounts. Again, our end products are expenditure and revenue vectors in which direct information about both parties to a transaction is lost. All transactions on capital account other than transactions involving newly produced capital goods are washed out. If other accounting systems do not distinguish transactions in the same way, reconciliation may be impossible. Imputations may be viewed as an alteration of the underlying transactions matrix, and an alteration of its property of being a record of actual transactions. Another practice that leads to problems of reconciliation is the conversion of transactions to a calendar year from a fiscal year basis and to an accrual from a cash basis.

A major reconciliation problem arises in the large number of government transactions that are sent to zero in the process of obtaining aggregates such as national income. Some of these transactions are presented separately. However, all transactions involving land, old assets, and financial items are sent to zero. Another major problem is that transactions of government enterprises are grouped with those of business, a step which may be viewed as an interchange of rows and columns of T brought about by interchanging corresponding rows and columns of A and B in identity matrix form. Entries other than those classified as value added are then sent to zero.

Similar conceptual operations yield input-output tables. The grouping matrices for the reduction of T to existing input-output tables are not equivalent to those utilized for the derivation of income and product information. An important distinction in operations is that the grouping matrices for input-output tables are not vectors. Transaction flows among actors are preserved, as is well known. This difference does not necessarily lead to irreconciable data as it represents in concept different degrees of consolidation. Also transactions in land and old assets, and transactions in financial assets are customarily sent to zero in the preparation of input-output tables. Some tables have also been prepared with government enterprise transactions grouped as intermediate product (conceptually all intermediate-type transactions could be placed in a north-west partition of (t_{ij}) by appropriate interchange of rows and columns of identity grouping matrices).

Reconciliation problems in the data prepared by these two sources[3] do arise from imputation practices that we have discussed. Problems also arise from the practice of netting items in the income and product accounts, a practice not followed in input-output tables. In the latter, government enterprise transactions are not consolidated with private business transactions.

Flow-of-funds or money flow data are reported to be designed as a record of actual transactions with emphasis upon financial transactions. In this instance, the grouping matrices operate upon (t_{ij}) so as to send no transactions to zero. Inspection of these accounts reveals also that while the detail about currently produced goods and services is less than that of other sources, some information as to parties of transaction, especially financial, is preserved. That is, each grouping matrix is greater in at least one dimension than its associate in the case of the income and product accounts. We note that money-flows data are on a cash basis, and contain no imputations. The degree of consolidation of transactions and transactors except for the financial sector is greater than in the case of other sources. We recall also that money-flows data are available over a shorter period of time. A good deal of netting of transactions is carried out.

The gap between money-flows data and income and product data seems larger than the gap between the latter and most input-output tables as presently constructed. What we have shown is that the difference between these accounts arises from current practice, not from any basic conceptual or a priori conflict. There would seem to be little logical difficulty to overcome in bringing the various accounts into a consistent framework, without impairing prevailing objectives.

Less well developed social accounting data on government revenues and expenditures are available from Bureau of the Census publications. These, however, possess desirable characteristics. They are with one minor exception consistent with cash budget items and therefore make up a balanced system. Operations such as sending transactions to zero, imputing transactions, and grouping actors with those of different motivations are avoided in the preparation of these facts. Data are given for fiscal periods in terms of cash transactions. We lack an isomorphism

between these series and cash budget series only to the extent that some items which are net in the latter are gross in the former. This reconciliation problem can easily be repaired by seeking more detailed information available separately in financial records. Census data possess further useful characteristics in that they reveal function in some detail although not account or object. This detail[4] is available at intervals from 1902 to date.

It may be objected that this argument is incomplete, and unfair, in that no mention has been made of the objectives of these varied practices which cause reconciliation problems. Ought not there be a discussion of the goal of estimating an aggregate welfare measure and the fine adjustments required in that case? It must be noted that our aims are not always well served by data prepared for these particular welfare judgements. To the extent that accounts describe actual transactions, the consumer of data rather than the producer could decide upon adjustments. A multiplicity of aims could be served.

FOOTNOTES

[1]Mr. Britton Harris, Research Coordinator of the Penn Jersey Transportation Study and Mr. M. Dutta, Department of Economics, University of Rhode Island, provided helpful discussions. Responsibility remains with the writer.

[2]A comparison of total federal, state, and local government expenditures as reported by the Bureau of the Census, by the National Income Division, and by the cash budgets of these government units can provide one illustration.

[3]By sources, I mean the Department of Commerce in the case of the income and product accounts and the Department of Labor (for example) in the case of input-output tables.

[4]Historical Summary of Governmental Finances in the United States, (U.S. Bureau of the Census: Washington) Vol. IV, no. 3 of the 1957 Census of Governments. In a letter dated September 1, 1960, Mr. George Jaszi, Ass't. Director of the Office of Business Economics, U.S. Department of Commerce, writes that "Government expenditures by function, in the national income and product framework, have not been prepared for the period prior to 1952."