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Construction of Regional Social Accounting Matrix: Methodological Concerns and Empirical Issues

by
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ABSTRACT

This paper proposes to do two things: (1) It will present a framework for the construction of a regional social accounting matrix (RSAM); and (2) it will discuss methodological and empirical issues which arise from the construction of a regional social accounting matrix for measuring equity effects of transport infrastructure projects.

The purpose of creating a regional social accounting matrix is to look at the impact of land transport infrastructure investment on regional economic variables, income distribution and ultimately social welfare. Moreover, this study will attempt to look into the spatial impact of public expenditures on transport infrastructure by looking at the individual regional economies; i.e. National Capital Region and the Rest-of-the-Philippines.

The next section will discuss the accounting concepts used in creating the regional social accounting matrix.

The following methodological issues in regional SAM construction will be discussed: (1) basis for factor and household classification; (2) problems in disaggregating sources of household income according to labor income, capital income, transfer payments and foreign incomes; (3) problems in making value judgements regarding data since regional data are based on administrative divisions; (4) other compilation issues like measurement of household activity, income and household savings; (5) balancing techniques.

An analysis of regional SAM coefficients for the National Capital Region will then be presented. This will be basis for deriving SAM multipliers for activities, value added and households at the regional level.

In the end, some policy directions may be derived regarding spatial impact and equity impact of transport infrastructure projects.

“By exaggerating differences in political and social objectives, one observes the fact that the main reason why we do not have a more successful economic policy is that we do not understand the economic system sufficiently well, and that what we should be doing is to study its anatomy and physiology instead of endlessly debating quack prescriptions either of inaction or of apocalyptic changes.” (Stone & Brown: 1962)

I. Introduction

The Metro Manila area, otherwise known as the National Capital Region (NCR), has been the focal point of major transport infrastructure development

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efforts for the past decades. Many economic activities are concentrated in this region. There is also significant income inequality not only between urban and rural areas but also between the NCR and other urban areas. The disparity in allocation of transport infrastructure investment has widened the gap between the NCR and the other regions. Being such, it is important to look into the effects of transport infrastructure investment policy on major regional economic aggregates and income distribution. One information base used in this type of impact analysis is the regional social accounting matrix.

This paper therefore proposes to do two things: (1) It will present a framework for the construction of a regional social accounting matrix (RSAM) which will be used for transport infrastructure investment impact analysis; and (2) It will discuss the methodological and empirical issues which arise from the construction of a regional social accounting matrix for equity effects

II. Description and Organization of the SAM

The social accounting matrix (SAM) represents transactions in a complete economic system. It integrates within a macroeconomic framework some detailed accounts for factors of production and institutions – especially households – so as to focus on the living standards of different groups in society. (Round: 2002)

What is a SAM? A SAM is a particular representation of the macro and meso economic accounts of a socio-economic system, which captures the transactions and transfers between all economic agents in the system. (Pyatt and Round, 1985; Reinert and Roland-Holst, 1997). In common with other economic accounting systems, it records transactions taking place during an accounting period, usually one year. Jeffrey Round elaborates on the main features of a SAM. The main features of a SAM are threefold. First, the accounts are represented as a **square matrix**; where the incomings and outgoings for each account are shown as a corresponding row and column of the matrix. The transactions are shown in the cells, so the matrix displays the interconnections between agents in an explicit way. Second, it is **comprehensive**, because it portrays all the economic activities of the system (consumption, production, accumulation and distribution), although not necessarily in equivalent detail. Thirdly, the SAM is **flexible**, in that, although it is usually set up in a standard, basic framework there is a large measure of flexibility both in the degree of disaggregation and in the emphasis placed on different parts of the economic system. Thus, not only is the SAM square but also the corresponding row and column totals must be equal. An overriding feature of a SAM is that households and household groups are at the heart of the framework. Only if there exists some detail on the distributional features of the household sector can the framework truly earn the label 'social' accounting matrix. Also, a SAM typically shows much more detail about the circular flow of income, including transactions between different institutions (including different household groups) and between production activities, and in particular recording the interactions between both these sets of agents via the factor and product markets. The SAM can then be used as an organizing framework for data and information base for policy analysis. (J. Round: 2002)

The SAM can also be defined as a numerical representation of national accounting system with detailed distributional aspects. A SAM would show how sectoral value added accrues to various factors of production and their institutional owners, and how these incomes are spent. The cycle is completed as the SAM traces how expenditures on various commodities lead to sectoral production and so to generation of value added. The SAM also shows all the "leakages" that take place from this cycle, for example in the form of payment made abroad or savings. There is possibility of linking capital finance to savings, and the dynamics of the economy also gets reflected (Keuning and Ruijter, 1988).

The SAM can be visualized as a one-time snapshot of an economy incorporating the interdependence that exists within a socioeconomic system through a consistently organized complete data system. The objective of the SAM construction would decide the classification scheme adopted in a SAM and the level of disaggregation. Industries can be differentiated into certain sectors, different types of skill can differentiate factors of production and households can be differentiated by certain socioeconomic classification depending on the interest of the study. Such a SAM would be able to provide useful information about significant intersectoral linkages, distribution of factor of production by sectors to different types of households on the basis of their resource endowments and other regional and external interconnections. (Round: 2002)

The earliest version of the SAM was the SAM produced by Stone and his associates for the United Kingdom economy in 1962. Stone referred to the SAM as the representation of the anatomy of the economic system, the physiology being represented by a separately specified multi-sectoral model. (Stone & Brown: 1962) The point is that SAM is simply an empirical description of an economy and is not, of itself, either an economic model or a formal specification of economic behavior.

Once the SAM is built with all the accounts in a consistent framework; this forms the transaction table providing the basis for the multiplier analysis to be undertaken. The first step is to decide which accounts are considered endogenous and which are to be kept exogenous. The framework can be used to measure the impact of changes in the exogenous accounts on the whole system. The SAM in this study consists of three sets of endogenous accounts, 1) production activities, 2) factors of production and 3) households. The other accounts are considered exogenous: 1) government, 2) capital, 3) net indirect taxes, and 4) rest of the world. Once the endogenous and exogenous accounts are decided, the transaction matrix can be transformed into corresponding matrix of average expenditure propensities. This can be obtained by dividing a particular column entry in the table by the column total. The proportions obtained from the endogenous accounts are the coefficients that will be used to obtain the multipliers. The proportions that are obtained from the exogenous accounts show the leakages, i.e., the proportion of each endogenous account that leaks out as expenditure into the external accounts without any feedback. The total transformed matrix is expressed as ratios where each column adds up to one. (Round: 2002)

III. The Intra-Regional SAM

This section will discuss the built-in causal structure of the SAM which is confined to a single region. The need for a regional SAM arises from the fact that policy shocks or exogenous events have a spatial dimension. This is necessary for building economic-transport models since the next step is linking individual regions in consideration of feedback and spillover effects through an interregional SAM.

In the case of the intra-regional SAM, this is the built-in causal structure. Madsen and Jensen-Butler indicate how a stylized flow of income could be detected from a regional SAM. The line of causality is from production to generation of income. Payment is made to factors of production due to their contribution to production activities. The factor incomes generated is then allocated according to primary distribution of income. This means income moves from production factors to institutions like households and to firms. Then income flows from primary account to secondary distribution of income. The latter includes transfers between institutions, like taxes, and income transfers from government. Next, households and other types of institutions satisfy wants through the use of disposable income. Part of disposable income goes to savings, which is revenue for the capital account. Savings from the capital accounts goes to expenditures for gross fixed capital formation and to the financial account. Wants are linked to commodities, which are in turn linked to activities, thus completing the demand circle. (Madsen & Jensen-Butler: 2001)

IV. Social Accounting Framework Used in Regional SAM (RSAM) Construction

In this section, the framework used in this study will be rationalized in terms of accounting concepts used, types of accounts and dimensions of the model.

It is deemed that initially, a small model in terms of levels of disaggregation of production sectors, factors of production and homogenous household grouping be considered. This is to test first, whether top-bottom derivation of cell entries in the regional SAM result in intuitively acceptable results.

In terms of accounting concepts, there are 3 areas which have to be resolved in the construction of RSAM: (1) the structure of production – in terms of interindustry linkages, disaggregation of final demand and gross value added distribution [to be derived from a the National Capital Region Input-Output Table]; (2) Income generation by factors of production and income distribution by institutional agents. [use of labor force survey data, census of establishments data and gross regional product and expenditure accounts] and (3) savings and investment patterns and flow-of-funds between domestic institutions and foreign agents [flow-of- funds statistics and balance of payment account of the Bangko Sentral]

The bottleneck here is reconciling data sources with different survey years and census years. The most basic data source with the longest interval in issuance of official statistics is the national input-output table. It used to be that the interval was 5 years. Lately however, the latest official I-O is 1994 and the 2000 I-O may be released in 2005.

To simplify the derivation of SAM coefficients, transactions in the rest-of-the-world account, the capital account and the government account are made exogenous. The endogenous accounts are limited to the production account (activities and commodities), factors and households. Also included are firm or corporate enterprise outlays like distributed profits and property incomes.

The next part of the accounting framework will explain types of accounts used. There are 8 sectors chosen for production activities with majority of sectors (6 to be specific) coming from the services sector. Since the study will highlight the income distributional effect of transport infrastructure investment, the transport service sector was disaggregated into land, air and water transport services sector. There are three primary factors of production listed which are labor, capital and land. All the other primary factors of production are lumped up as other value-added. There are two current institution accounts and these are those of the household and the government.

Simplicity is the rule in creating this small dataset since the regional totals will be reconciled with national totals as a way of balancing column sums and row sums.

The dimension of SAM coefficient matrix to be derived is 14 by 14. This can be broken down into 8 sectors for production activities; 4 types of primary factors of production and 2 institutions – government and household. The 8 production sectors are (1) agriculture, fishery & forestry, (2) industry, (3) trade, (4) land transport services, (5) water transport services, (6) air transport services, (7) other private services and (8) government services. The 4 factor inputs are labor, capital, land and other inputs accounting for value-added.

It will be pointed out that trade sector and government service sector were picked out as separate production sectors since changes in transport infrastructure investment have strong interindustry and factor income linkages with these subsectors of services sector. Since a major bottleneck in transport infrastructure is related to land, then it was also considered as a separate primary input.

The main issue here is the reconciliation of different data sources to fit into the SAM coefficient framework. These data sources include the National Input-Output Table, NCR Input-Output Table, Census of Establishments, Family Income & Expenditure Survey, 1994-Flow-of-Funds Matrix of the Bangko Sentral ng Pilipinas and the 1994 Labor Force Survey. The first four mentioned have all official releases for 1994 on an annual basis, except for the Labor Force Survey which comes out quarterly.

V. Construction Methodology by Major Blocks

There are 3 major blocks considered as basis of regional SAM construction. These are the national input-output table, factor income data and flow-of-funds data. Of the three, only the first two are the highly disaggregated blocks for this study.

1. Input-Output data

This discussion will focus on the first block – I-O table. To construct a regional SAM, the first step is to extract a regional I-O table from the national I-O table. There is no official regional input-output table., Non-survey regionalization techniques are utilized to derive the NCR I-O table. These include location quotient method and RAS techniques. There is a 1994 national I-O table which serves as take-off point for 1994 regional SAM.

The main empirical issue here is capturing regional trade data. Foreign trade statistics are available at the national level. The only regional trade statistic officially released is the net export data from regional gross expenditure accounts. Moreover, while commodity flow and people movement may be deduced from official data; there are limitations in these data collected. Most of them do not contain origin-destination data. For commodity flow, we still do not have commodity flow by land transport because it is difficult to survey land transport infrastructure. Survey data need to be utilized for this. Maybe, a rider survey to FIES on land transport flows can be adopted to solve this problem. Migration data is available every 5 years and these have to be reconciled with corresponding factor income flow. The phenomenon of cross-hauling is not considered in location quotient method. However, the fact that capital and land are immobile lessens regional data demand.

Moreover, the value-added component of production contains several factor incomes which are lumped up into one category - “other value added” category. Not much information can be deduced from this. Appropriate indicators have to be adopted to allocate factor income according to 4 categories.

The third concern is with updating 1994 data to 2000 data. Most of the vital data sources for an updated NCR SAM 2000 are still not available. Despite the presence of non-survey techniques in updating 1994 to more recent data; official updated primary datasets are ideal building blocks of the regional SAM.

2. Factor Income Data

The second crucial block is the factor income block.

Information on factor income can be derived from 2 main sources – the value-added component of the I-O table, the Family Income and Expenditure Survey for the Household, Gross Regional Expenditure Accounts, Government Budget Accounts and National Income Accounts. For example the composition of

income of primary factors of production can be found in sectoral value-added in the national I-O table.

The main concern here is extracting the different primary inputs from the "other value added" category in I-O tables. The SAM compiler has to use suitable indicators in prorating national totals into regional totals

The issues with regards to factor income concerns the appropriate value which is entered in regional SAM cell. The issues raised by Cororaton in deriving national totals for 1994 SAM are as follows: (1) understatement of compensation of employees figure; (2) reconciling indirect tax figures with government account figures and (3) reconciling labor force survey data with FIES data.

3. Flow-of –Funds Data

There will be no discussion on this because the financial sector was assumed to be an exogenous account.

VI. Issues in Regional SAM Construction

(1) Use of bottom up or top down approach - The dilemma here is whether national SAM figures should be used to derive regional SAM. Or should it be that regional totals are added up to get to national SAM totals. This debate was highlighted in the paper by Erik Thorbecke (2001) which focused on whether the SAM was a deterministic or stochastic concept. Thorbecke advises the use of bottom up approach. He believes that more information is better than less information and that all information available should be used in constructing a SAM. He suggests the usage of RAS techniques or Stone-Byron method in arriving at credible estimates of certain cells. He acknowledges that since data used in SAM preparation comes from different sources, then many estimates of SAM cells rely on a hybrid combination of different information sources which contain sampling and non-sampling measurement errors.

(2) Disaggregation of household income according to labor income, capital income, transfer payments and foreign income. According to a paper by Cororaton, (2003), sources of income of household vary by income level. His research came up with the following findings. The lowest income levels depend largely on labor income. The highest income levels depend on capital income. To some extent, certain household deciles depend on capital income while the lowest urban household decile depends on government transfers. Most rural households depend on labor income and capital income whereas only a small portion of their income comes from dividend transfers.

(3) Delineation of a region - Disaggregating by administrative divisions of the region creates certain problems in making value judgements regarding the data. This is because current regional disaggregation is not based on centers of economic interest. For example, due to the spillover effects of development in

Metro Manila, it may be wise to segregate CALABARZON from Region 4 which is the Southern Tagalog region. However, this implies that critical macro-variables would be available at the provincial level.

Ideally, for purposes of economic impact analysis, regions should be centerpoints of economic interest. For the empirical findings to be truly meaningful, the division of the economy into spatial units should be such that clustering of administrative units provide important insights as far as interaction is concerned. These grouping provide a more useful framework for integrative development planning.

(4) Factor and household, product classifications - Pyatt and Thorbecke (1976) set out certain principles and guidelines for choosing factor and household classifications. In the case of households, they assert that classifications should be chosen to introduce as much within group homogeneity relative to between – group differences as is possible, considering limitations on the number of classifications which can be supported by the data. In the case of factor accounts, the aim should be to choose classifications which identify distinct factor markets. Classification of households should be according to overall analytical or policy focus and to the extent that these classifications can be supported by the data. Examples of criteria used include: (1) geographical location (urban-rural), assets (wealth, size of landholding) and the socio-economic characteristics of a representative individual (e.g. household head or principal earner) [Round: 2003].

J. Round expounds on other rules with regards to classification of SAM entries. According to him, labor is often cross-classified by location (urban-rural, or geographical region), skill or educational attainment, employment status (whether employee, own account worker, employer) and by gender. Mixed income is frequently chosen as a category to represent the income of household enterprises where it is difficult to distinguish the returns to labor from the returns to other factors, and is also cross-classified in a similar way to labor. Division of households by income level is frequently avoided because households are potentially mobile across income groups. However, income percentile groupings are frequently used for making cross-sectional comparisons. In the case of urban-rural households, Round suggested that urban households be disaggregated by socio-economic groups while rural households be disaggregated by some dimension of land holding. In the case of capital and natural resources, there may be multiple accounts if these factors are assumed to be sector-specific and not fully mobile. [Round: 2003]

VI. Empirical Application of SAM Coefficients

Given all of the issues and concerns raised above, a set of SAM coefficients was derived for National Capital Region using 1994 data and the methodology in Holland and Wyeth (1993).

Preliminary results indicate that as far as SAM multipliers for activities are concerned, transport sectors have one of the highest impact– as evidenced by the table below. A one unit increase in government spending on transport

infrastructure investment will generate the following SAM multipliers. The SAM multipliers work in such a way that increases in government expenditures for example on transport infrastructure, lead to a rise in output of activities of production and on the incomes of households directly. Then indirectly, value-added increases, increasing factor incomes and increasing household incomes according to the combination of factors each household owns. Hence SAM multipliers account for both the direct and indirect effects of increases in the transport infrastructure spending and also for the induced effect on factor and household incomes and activity outputs due to the Keynesian expenditure-income multipliers. These are commonly called Type 2 multipliers.

Production Activity	SAM product-activity multiplier
Air Transport Services	4.7435142
Government Services	4.6495245
Land Transport Services	4.4899888
Industry	4.4318471
Water Transport Services	4.1765953
Other Private Services	3.835749
Agriculture, Fishery, & Forestry	3.7522609
Trade	3.7063998

As far as value added SAM multipliers are concerned, it is labor income which has the highest impact, then capital income, other value-added (interest income, royalties, etc.) & government income as evidenced by the following table. This means that the induced labor income brought about by more spending on transport infrastructure benefits the labor sector the most, compared to capital, land, interest and profit income.

Value-Added Component	Value Added SAM Multiplier
Labor Income	3.441772
Capital Income	2.7034086
Other Value-Added	1.6229055
Land	1.285544

And the most important result is that the endogenized household sector has the highest SAM multiplier which is 5.1309777. This is followed by the government sector which is 4.6495245. This therefore ultimately shows that it is the household sector which is the main beneficiary of transport infrastructure investment in National Capital Region.

VII. Conclusion

The preceding discussion highlighted the importance of a regional social accounting matrix in understanding economic structure and interdependence of production, consumption, accumulation and distribution. It sought to establish the connection between income distribution and economic structure through the construction of simple SAM for the National Capital Region.

While this undertaking may be very demanding in terms of time, effort and money; the insights and policy directions to be gained from using SAM data may offset all the accompanying costs with its construction.

It may provide the comprehensive framework which will tie up all data-gathering endeavors of government statistical agencies. Hopefully, government will find value in regional SAM construction and allot some funds for its construction.

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