Chapter 14

Social Accounting Matrices and SAM-based Multiplier Analysis

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14.1 Introduction

This chapter sets out the framework of a social accounting matrix (SAM) and shows how it can be used to construct SAM-based multipliers to analyse the effects of macroeconomic policies on distribution and poverty. Estimates provided by a social accounting matrix (SAM) can be useful - even essential - for calibrating a much broader class of models to do with monitoring poverty and income distribution. But this chapter is limited to a review of how SAMs are used to develop simple economy-wide multipliers for poverty and income distribution analysis.

What is a SAM? A SAM is a particular representation of the macro and meso economic accounts of a socio-economic system, which capture 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. 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*, in the sense that 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. As it is an accounting framework not only is the SAM square but also the corresponding row and column totals must be equal. Clearly, at one extreme, any set of macroeconomic aggregates can be set out in a matrix format. But this would not be a 'social' accounting matrix in the sense in which the term is usually used. 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

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particular recording the interactions between both these sets of agents via the factor and product markets.

The origins of matrix accounting go back a long way, but it is generally acknowledged that SAMs were initially due to the pioneering work of Sir Richard Stone in the 1960s based on the United Kingdom and some other industrialised countries. These ideas were further developed and used to help address poverty and income distribution issues in developing countries by Pyatt, Thorbecke and others from early in the 1970s onwards (Pyatt and Thorbecke, 1976). A large number of SAM-based multiplier studies have since followed, some of the earliest being for Sri Lanka (Pyatt and Round, 1979), Botswana (Hayden and Round, 1982), Korea (Defourny and Thorbecke, 1984), Indonesia (Thorbecke, et al, 1992), and more recently, for Ghana (Powell and Round, 2000) and Vietnam (Tarp, Roland-Holst and Rand, 2002).). In all of these studies the aim has been to examine the nature of the multiplier effects of an income injection in one part of an economic system on the functional and institutional distribution in general and on the incomes of socio-economic groups of households in particular. It should be noted that some similar multiplier analyses that aimed to close the input-output model with respect to households by incorporating a (Keynesian-type) income-expenditure loop within an input-output framework, were proposed by Miyazawa (1976) and others also in the early 1970s (see Pyatt, 2001 for a discussion of this earlier history).

Three principal motivations underlie the development of SAMs. First, the *construction* of a SAM helps to bring together data from many disparate sources that help to describe the structural characteristics of an economy. A SAM can also be used to good effect in helping to improve the range and quality of estimates, by highlighting data needs and identifying key gaps. Secondly, SAMs are a very good way of *displaying* information; the structural interdependence in an economy at both the macro and meso levels are shown in a SAM in a simple and illuminating way. A SAM shows clearly the linkage between income distribution and economic structure and, of course, this is especially important in the context of this volume. Thirdly, they represent a useful analytical framework for *modelling*; that is, they provide a direct input into a range of models, including fixed-price multiplier models and are also an integral part of the benchmark data set required to calibrate computable general equilibrium (CGE) models (Pyatt, 1988).

In summary, a suitably-designed and disaggregated SAM shows a great deal about the structural features and interdependencies of an economy. It represents a snapshot of the transactions (flows) taking place in a given year. The SAM is a meso-level framework: it serves as a useful bridge between a macro framework and a more detailed description of markets and institutions. Of course the detail in the SAM might not be limited to the real economy, and there are some notable examples of SAMs and SAM-based models that incorporate the financial sectors and the flow of funds (see Sadoulet and de Janvry, 1995). Clearly the economic structure of the SAM may change as the economy changes and responds to shocks. A more formal modelling approach should therefore include structural or behavioural specifications for the various groups of transactions. This is especially true for example if the structure changes as a result of changes in relative prices. However, often as a first-cut *ex ante* analysis, a SAM has frequently been used to examine the partial equilibrium consequences of real shocks, using a multiplier model that treats the circular flow of income endogenously. The circular flow captures the generation of income by activities in producing commodities, the mapping of these income payments to factors of production of various kinds, the distribution of factor and non-factor income to households, and the subsequent spending of income by households on commodities. These patterns of payments are manifested in the structure of the SAM, and are modelled analogously to the input structure of activities in an input-output model based only on interindustry transactions. However, it is important to stress that the results differ from input-output by virtue of the fact that input-output multipliers are augmented by additional multiplier effects induced by the circular flow of income between activities, factors and households. A main outcome of SAM-based multiplier analysis is to examine the effects of real shocks on the economy on the distribution of income across socio-economic groups of households. One other important feature of SAM-based multiplier analysis is that it lends itself easily to decomposition, thereby adding an extra degree of transparency in understanding the nature of linkage in an economy and the effects of exogenous shocks on distribution and poverty.

14.2 SAM-based techniques

a) Basic SAM structure

A simple, stylised SAM framework is shown in Table 14.1. It is a square matrix that represents the transactions taking place in an economy during an accounting period, usually one year. Table 14.1 shows a matrix of order 8 by 8. Without further detail the table represents a macroeconomic framework of an economy with three institutions: households, corporate enterprises and government. Each account is represented twice; once as a row (showing receipts) and once as a column (showing payments). The SAM records the transactions between the accounts in the cells of the matrix (T_{ij}). So a payment from the jth account to the ith account is shown in cell T_{ij} according to the standard accounting convention in an input-output table. The ordering of the rows and columns is not crucial, although the rows are always ordered in the same way as the columns. In many SAMs and SAM-based analyses the leading accounts are chosen to reflect our primary interest in living standards and distributional issues; so that institutions (households) or factors of production are ordered first. In Table 14.1 the ordering begins with production, as it does in an input-output table, although this does not affect the data structure or the modelling techniques in any other way.

[Table 14.1 here]

Viewed as a macro SAM Table 14.1 shows clearly the three basic forms of economic activity; production (accounts, 1, 2 and 3), consumption (accounts 4, 5 and 6), accumulation (account 7) plus the transactions with the rest of the world (account 8). It is a simple and comprehensive framework corresponding directly to a flow chart of the same transactions shown in Figure 14.1. The main economic aggregates can be ascertained directly from the macro SAM. Thus, the generation of value added by domestic activities of production, which constitutes GDP, is found in cell (3,2); final consumption expenditure by households is shown in cell (1,4), and so on. It has been conventional for quite some time to distinguish production activities from the commodities that they produce. It means that the underlying input-output tables come with two components, a matrix of 'uses' of commodities and a matrix of commodity 'supplies' (i.e. supply-use tables).

[Figure 14.1 here] [Box 14.1 about here]

The main interest in compiling and using a SAM is to engage in further disaggregation of certain accounts in the macro system and to estimate the transactions in more detail. Thus the SAM evolves from being a macro SAM to become a meso framework. It records consistent and sometimes quite detailed sets of transactions and transfers between different kinds of agents often interacting through different markets, especially the commodity and factor markets. In principle, there is no limitation on the extent to which accounts may be disaggregated. However, for the purpose of tracing the process of income generation, its distribution and redistribution across households, and the structure of production in multiplier models, the accounts that have typically been subject to most disaggregation are the production accounts (activities and commodities), factor accounts, and household and other institution accounts. Extended modelling and analysis may require further disaggregation of the tax and government accounts (say to distinguish taxes for tax incidence analysis), capital accounts (to identify the flow of funds, and to depict different kinds of financial and asset markets), external accounts (to show more detail of external transactions for trade analysis).

More disaggregation and increased detail in the SAM does not come without a cost. The SAM has a voracious appetite for data, although it must be said that much can be (and has been) achieved with small datasets, a careful choice of classifications, and a few simplifying assumptions. The single entry system means that with more transactors (e.g. households or production activities) there is a need to identify the origins and destinations of a much greater set of transactions in the system. This is often non-trivial. The compilation process requires detailed information from production surveys and household and labour force surveys (e.g. LSMS or Integrated Household Surveys) alongside the national accounts, balance of payments statistics, and a supply-use table. (See Box 14.2 for an illustration of some compilation issues.) Some basic guiding principles for choosing the classifications for the household and factor disaggregations have evolved and suggest the following:

> *Households:* These are usually represented by socio-economic group, classified according to characteristics of either the household head or the principal earner (gender, employment status), often by locations (rural/urban, etc), and sometimes other characteristics including assets or main income source (farm/non-farm, etc). Income level is usually avoided as a criterion because individual households may be mobile between income groups thus creating difficulties in targeting specific households or any analysis of changes in poverty or distribution (Pyatt and Thorbecke, 1976). Nevertheless it is possible to disaggregate the socio-economic groups further according to their income distribution, and therefore to show the within-group characteristics of poverty and inequality. Based on real observations over time this would give some comparative measure of changes in poverty and inequality within groups.[2]

> *Factors:* These accounts record the income generated by production activities in employing various kinds of factors of production. Income is mapped to those households and other institutions who supply these factor services in accordance with their factor endowments and their access to factor markets. Apart from broad functional distinctions between labour, capital and land, the labour accounts are usually disaggregated (by gender, skill, education level, location, etc) relatively more than are the capital accounts (by domestic and foreign capital, etc). The main aim is usually to focus on any labour market segmentation that might have structural consequences, especially in determining impacts on different groups of households.

b) SAM-based multiplier models

The SAM is not, of itself, a model. It is simply a representation of a set of macro-meso data for an economy. However, suitably designed and supported by survey data and other information it does suggest some important and useful features about socio-economic structure in general, and the relationship between the structure of production and the distribution of income in particular. The basic approach to SAM-based multiplier models is to compute column shares (column coefficients) from a SAM in order to represent structure and, analogous to an input-output model, to compute matrix multipliers. In doing so, one or more of the accounts must be designated as being exogenous otherwise the matrix is not invertible and there are no multipliers to be had. Therefore, in developing a simple multiplier model, the first step is to decide which accounts should be exogenous and which are to be endogenous. It has been customary to regard transactions in the government account, the

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[2] Even if within-group distributions are available only for one (base year) SAM then the multiplier models subsequently discussed, based on constant within-group distributional patterns, would provide some means of linking macro shocks with poverty and distributional analysis.

capital account and the rest of the world account to be exogenous. This is because government outlays are essentially policy-determined, the external sector is outside domestic control, and as the model has no dynamic features so investment is exogenously-determined. The corporate enterprise outlays (e.g. distributed profits and property incomes) are variously treated as either being exogenously- or endogenously-determined. The endogenous accounts are therefore usually limited to those of production (activities and commodities), factors and households (private institutions). Defining the endogenous transactions in this way helps to focus on the interaction between two sets of agents (production activities and households) interacting through two sets of markets (factors and commodities). For simplicity the exogenous accounts may be aggregated into a single account, which records an aggregate set of injections into the system and the leakages from it.

[Table 14.2 here]

Like an input-output model, the matrix of endogenous transactions, which are represented in summary form by the matrix T , can be used to define a matrix A of column shares, by dividing elements in each column of T by its column total

$$T = Ay \tag{1}$$

where T and A have the partitioned structure shown in Table 14.2. The component submatrices of A show, for example, that A_{32} is the matrix of value added shares of factor incomes generated by activities; A_{43} is the shares of factor incomes distributed across households, and A_{14} shows the pattern of expenditures by each household group. Several submatrices show no transactions in the SAM and these are recorded as zeros. Similarly x and y are, respectively, the vectors of exogenous injections and account totals, where, for example, x_1 is the vector of all purchases of final goods and services other than those by households and y_1 is the total demand for products. The endogenous row accounts in Table 14.1 can then be written as a series of linear identities and the system can be solved to give

$$y = Ay + x$$

$$= (I - A)^{-1} x = M_A \; x \tag{2}$$

where M_A is the SAM multiplier matrix. More precisely, it is a matrix of 'accounting' multipliers. If A represents the pattern of outlays (i.e. expenditure and distribution coefficients) and is assumed to be fixed, then M_A is fixed, and equation (2) determines the equilibrium total outputs and incomes y consistent with any set of injections x. To illustrate its use, suppose we examine the possible effects of a reduction of government expenditure, including a reduction in wage and salary payments to government employees. Government expenditure is part of the exogenous accounts so, assuming the same endogenous *patterns* of expenditures and income payments elsewhere in the economy maintains, equation (2) computes the simple multiplier effects (which would be reductions in this case) on outputs of activities of production and, importantly, on incomes of household groups. In more detail, the reductions in government expenditures reduce the activity levels and household incomes directly, but also indirectly (the multiplier effects) in that value added is reduced, lowering factor incomes, and reducing household incomes according to the combinations of factors each household owns. The latter translates into changes in the total income of each group, or equivalently, in the mean household group income. This example is illustrative of the focus of SAM multipliers in determining the total income effects on different household groups that arise from an exogenous (policy-determined or external) shock. Input-output multipliers capture only the interindustry effects; even though these will propagate some income effects in so far as changes in outputs directly and indirectly affect incomes. However, SAM-based multipliers account not only for the direct and indirect effects but also for the induced effects on factor and household incomes and activity outputs due to the (Keynesian) income-expenditure multipliers (Robinson, 1989; Adelman and Robinson, 1989).

'Fixed-price multipliers', based on marginal responses, are distinguished from 'accounting multipliers', based average patterns, although both sets of multipliers are derived in constant prices and are therefore 'fixed-price' in a formal sense. The distinction simply recognises that the marginal responses in the system, even in a fixed-price world, may be different from what they are on average. Thus

$$dy = (I - C)^{-1} dx = M_C \; dx \qquad (3)$$

where C is the matrix of marginal propensities and M_C is now the multiplier matrix. C is computed from A as follows: $C_{ij} = \eta_{ij} A_{ij}$ where η_{ij} is the elasticity of *i* with respect to *j*. Pyatt and Round (1979) computed both kinds of multipliers in a study for Sri Lanka, by using data on income elasticities for one part of the SAM, namely household expenditures on commodities. All other elasticities were effectively set at unity, so the numerical differences between the two sets of multipliers were very small but, conceptually, this helps to break away from relying on the outlay patterns *per se*. In most studies accounting multipliers are used as though they are fixed-price multipliers, and equivalently the income elasticities are set at unity.

SAM-based multipliers rely on some strong assumptions; so, rather like the data side, simplicity and transparency do not come without cost either. First, using the model to explore the distributional consequences of positive shocks (i.e. expansion of export demand, or increases in either government spending or investment) the implicit assumption is that there is excess capacity in all sectors and unemployed (or underemployed) factors of production. In this case the multipliers work through to the equilibrium solution, but if there are capacity constraints of any kind then the multipliers will overestimate the total effects and the final distributional effects will be uncertain. Secondly, as prices are fixed, there is no allowance for substitution effects anywhere, or at any stage. Again this may also lead to an overestimation of the total response. Thirdly, when prices are not fixed they may be expected to rise (fall) to offset excess demands (supplies) in any of the markets. Therefore any price changes would tend to mitigate the total effects implied by the fixed price model. Fourthly, the distinction between endogenous and exogenous accounts naturally means that there is a limit to the endogenous responses that are captured in the multiplier model. Clearly, the exogenous accounts will be affected by the initial shock and by changes in the leakages from the endogenous to the exogenous accounts to balance the exogenous accounts as a group. But other than this no other responses can occur within the exogenous accounts, whereas in practice they may - government expenditures might change as a result of a trade shock and an effect on the trade balance. So to this extent, the multiplier effects will be under-estimated. Overall it is obviously difficult to generalise about the validity of the SAM multipliers in all settings. In some cases the assumption of a perfectly elastic supply of outputs and factors is reasonable, while in others it is not. At best, SAM multipliers provide us with a first-cut estimate of the effects of a policy or external shock, relying only on the SAM structure. It is an appealing though somewhat limited analytical technique which should not be applied mechanically without due care..

c) Decomposing multipliers

The SAM multiplier analysis may, under the circumstances described above, give some indication of the possible resultant effects of an exogenous shock on the functional (factoral) and institutional distributions of income as well as on the structure of output. However, to create more transparency, and in particular to examine the nature of linkage in the economy that leads to these outcomes, it is possible to decompose the SAM multipliers further.

The simplest decomposition of all can be obtained by reducing the SAM to two endogenous accounts, activities and households (institutions), by solving out the accounts for the factor and commodity markets[3]. In this, and similar cases, the SAM multiplier can be shown to decomposable into three multiplicative components (Pyatt and Round, 1979)

$$dy = M_C dy = M_3 M_2 M_1 dx \tag{4}$$

where M_1, M_2 and M_3 are all 'multiplier' matrices[4]. In this case the interpretation of the matrices is direct. M_1 represents the 'within account' effects, that is the multiplier effects an exogenous injection

[3] The four simultaneous equations can be reduced to two by eliminating two of the variables (factors and commodities) by substitution.
[4] M is a multiplier matrix if $M \geq I$.

into one set of accounts (say either the activities' accounts or the households' accounts) will have on that same set of accounts. For activities this component is the input-output multiplier, for households this component will reflect any interdependencies that arise from the patterns of transfers of income between households (e.g. urban to rural remittances). M_2 captures the 'cross' (or 'spillover') effects, whereby an injection of income into one set of accounts (say, activities) has effects on the other set of accounts (say, households), with no reverse effects. M_3 shows the multiplier effects due to the full circular flow, these are the 'between-account' effects, after extracting the 'within-account' multipliers. It is of interest to ascertain what might be the relative magnitudes of these component multipliers in order to understand rather more about the nature of linkage and to identify areas of duality in the economy. For example, the multiplier effects due to input-output linkages (activity to activity) may be small relative to the effects due to the linkages between activity outputs, factor incomes, household incomes, household incomes, and activity outputs through their demand for products. Also, these linkages may be stronger for some parts of the economy than others showing different values for the different multipliers for rural households, say, than for urban households. Though simple in concept, equation (4) is difficult to examine in practice. Therefore Stone (1985) proposed an additive variant that is used in most practical studies[5] (an example will be shown later)

$$dy = \left[I + (M_1 - I) + (M_2 - I)M_1 + (M_3 - I)M_2M_1\right] dx \qquad (5)$$

Although this decomposition shows the broad linkage between individual accounts, Defourny and Thorbecke (1984) have argued that even more operational usefulness can be gained by seeking to identify the strength of the various paths along which an injection travels. They proposed an alternative decomposition using structural path analysis that identifies a whole network of paths by which an exogenous injection into one account reaches its endogenous destination account. Thus, in understanding how the incomes of a particular household group, say small-scale farmers, may be affected by an exogenous increase in, say, textile output, the method identifies all the various paths from origin to destination. It may be that the income effects arise directly (via the hiring of unskilled labour supplied by these households in the textile sector) or indirectly (via a stimulus from increased spending on food crops resulting from the increased incomes of unskilled labour, the increased production of which also needs unskilled labour) (Thorbecke, 1995). Structural path analysis computes the importance of the various paths relative to the global influence. For example, the global influence of a one-unit increase in textile output on the incomes of small-scale farmer income may be computed (from the multiplier matrix M_c) to be, say, 0.05. Of this total increase in small-scale farmer household incomes, 35% might be due to the relatively direct path via the hiring of unskilled labour, 10% to a more indirect path via the increased spending on food crops, and the remaining 55% due to a variety of other indirect paths.

[5] The additive decomposition is not unique.

One major limitation of the application of SAM multipliers for poverty analysis is that, no matter how disaggregated are the accounts of a SAM, the multiplier effects are confined to determining the income effects of (socio-economic) household groups. The intra-group income distributions are not generated directly. Clearly, if poverty is largely identifiable with certain socio-economic groups and not with others then the group effects can be informative. On the other hand it is necessary to try to link the multiplier effects on household group incomes to possible changes in poverty within groups. To do so usually requires some assumption to be made about the income distribution parameters within household groups (variance or Lorenz parameters). Thorbecke and Jung (1996) proposed such a method based on estimated poverty elasticities (in their case for Indonesia) defined for the FGT (P_α) poverty ratios. Elasticities of the poverty ratios, P_0, P_1 and P_2 defined with respect to the mean per capita income of each household group, assuming distributionally-neutral impacts, are estimated independently of the SAM. These elasticities are then linked via the household group incomes and fixed price multipliers to unit expansions in the output of each activity. As a result Thorbecke and Jung were able to derive a set of activity-specific poverty elasticities which they termed 'poverty alleviation effects'. These show the poverty alleviation responses that arise from unit expansions of each activity taking account of the various multiplier effects described above. This is a good illustration of a practical use of SAM-based multipliers in the context of poverty analysis.

14.3 Application of the technique of SAM multiplier analysis

Many SAMs have now been compiled and it is a fairly routine procedure to compute the SAM-based multipliers at an early stage of analysis. The methodology is so straightforward (an Excel spreadsheet will suffice to compute multipliers for even moderately large dimensional SAMs) that few multiplier analyses are now published but are often available as unpublished studies. Four studies selected here illustrate some best practice methods and provide examples of some results.

a) Sri Lanka

A pioneering study that computed not only accounting and fixed-price multipliers but also the multiplier decompositions outlined earlier (equations (4) and (5)) was based on an early and quite rudimentary SAM for Sri Lanka for 1970 (Pyatt and Round, 1979). The methodology has since been replicated on numerous occasions using SAMs for other economies. The SAM was fairly aggregative by current standards; only three labour accounts and three household groups were distinguished - representing urban, rural and estate households/workers - alongside twelve production sectors. In 1970 poverty incidence in Sri Lanka was especially high amongst the estate workers, and one notable outcome from the multiplier analysis was to demonstrate just how dualistic the structure of the economy was. The income multiplier was considerably lower for estate households than for urban or rural households, except when the injection was in the tea or rubber sectors (e.g. an increase in exports of tea or rubber). This suggested that indirect effects could not be relied upon to alleviate poverty in this, the poorest, sector and that estate households needed to be targeted directly. A second observation, again repeated since, was to show that the input-output multipliers (M_1) were low relative to the 'between-account' multipliers (M_3). This further suggested that more emphasis needed to be placed on tracing and mapping the income generated to factors and the transmission of this factor income to households, rather than estimating interindustry linkages, as the latter are so weak.

b) Ghana

The general features of the SAM multiplier and multiplier decomposition analysis can be illustrated by a study based on a 1993 SAM for Ghana by Powell and Round (2000). Table 14.3 shows an extract from the results using the Stone additive decomposition procedure (equation (5)). Consider the first panel for illustration. On the basis of the linkage structure shown in the SAM, an exogenous injection of an extra 100 units of income into the cocoa sector (arising say from additional cocoa exports) leads to additional household incomes of 107 in urban areas and 71 in rural areas, after taking into account the various transfer (within-account), spillover and feedback effects. In this case the 'cross' (M_2 , or spillover) effects account for income effects of 40 (urban) and 28 (rural), while the 'between-account' (M_3) multipliers account for a further 67 and 43 respectively. The effects of the injection on factoral incomes are also shown; again, the M_3 multipliers account for the largest component, and the effects via the 'mixed' income category of 83 is particularly noteworthy. The second panel shows that the effect on household incomes from an exogenous injection into mining is far lower, the incomes of urban households rise by 63 and of rural households only by 43. This is largely explained by the reduced effects on the mixed income category of factor incomes, which amount to 58. In both cases (cocoa and mining) it is noticeable how large is the 'between-account' (M_3) effect relative to the spillover effect from the receipts of factor incomes (M_2).

Now consider the third panel which looks at the impacts of social expenditures. In terms of overall income effects, the SAM structure suggests that an exogenous injection of 100 units of income into the health and education sector would have larger effects on household incomes than an injection into either cocoa or mining (urban 132 and rural 84). But this illustrates the need to exercise caution in interpreting the results. Clearly, public expenditure injections have to be financed in a way that the increased exports of cocoa or minerals do not. On the other hand, the income effects of the health and education injections indicated here are quite separate from, and are additional to, the health and education benefits that might accrue to the recipients due to the consumption of these services. Finally, it can be noted that, as in the case of cocoa and mining, the overall results indicate relatively low input-output linkages. The input-output multiplier for health and education is zero and the total activity multiplier for all sectors due to this injection is only 14. Thus, in general, for the sectors in which the injections take place, the multipliers are extremely small and the total activity multipliers are also small (M_1), substantially boosted in each case by the 'between-account' effects (M_3).

[Table 14.3 here]

c) South-Korea

Defourny and Thorbecke (1984) have computed detailed structural path multipliers based on a 1968 SAM for South-Korea. One significance of their study is to demonstrate the methodology, which is far more complex than the calculation of the matrix multipliers in the Pyatt-Round procedure. A key table in Defourny and Thorbecke (1984) shows a selection of global influences (total multipliers) for various paths of injections and account destinations. For each global influence there may be several alternative loops (elementary paths) and the method computes the percentage of the global influence accounted for by one or more elementary paths. In particular the loops that define connections between an exogenous injection and the effects on a particular household group (e.g. a poor household) help to provide insights into the income transmission channels. For example, Defourny and Thorbecke show the relative importance of paths of the multiplier effects on households headed by unskilled workers that arise from an injection in the processed foods sector. They show first, that it matters whether the injection is via a large-scale or a small-scale activity. Not surprisingly, the multiplier is higher in the latter case than the former, but not by much. Secondly, in each case the direct elementary path to unskilled worker households, via the activity demand for unskilled labour, allowing for multiplier effects along the way, accounts for no more than 25% of the global effect. The remaining portion of the global effect is due to the contribution of indirect paths.

d) Indonesia

As part of a series of OECD Development Centre country case studies on 'Adjustment and Equity' Keuning and Thorbecke (1992) used SAM-based multipliers to trace through the effects of government budget retrenchment in Indonesia in the 1980s on each of ten socio-economic household groups. The SAM is more disaggregated, the income mappings are more detailed and the effects on income distribution are therefore much more sensitive to the exogenous shocks. A further novelty is that, unlike the Ghana example referred to earlier, the study also builds in the loss of imputed benefits to households due to a reduction of health and education expenditures, and therefore attempts to construct a more complete estimate of the impact of budget retrenchment on households. Finally, the analysis of base year structure is extended to show the relative influence of the different components of exogenous expenditures on different household groups. The results show, for instance, that higher income rural and urban households were more influenced by government current expenditure injections than by exports. They contrast with the results for the rural and urban poor, who were more equally affected by all components. Finally the extension by Thorbecke and Jung (1996), based on the same Indonesian SAM, sought to determine the poverty-alleviation consequences of sectoral growth, taking into account the SAM-based multiplier effects and poverty elasticities. As noted earlier the poverty elasticities define the P_α responses due to changes in mean per capita incomes, and are derived independently of the SAM. The case study for Indonesia showed that a growth in agriculture and agriculture-related activities tend to do more to alleviate poverty than growth in industrial, or even service activities, even after accommodating the various multiplier effects.

14.4 Conclusions

This chapter has shown how a social accounting matrix (SAM) can be used to provide a bridge between macro and micro analysis of the poverty impacts of policy via socio-economic household groups. As a data and economic accounting framework, which integrates the macroeconomic accounts with key micro datasets, especially household and labour force surveys, many of its virtues are self-evident. As a single-entry accounting system in which the transactions between agents are traced through explicitly the SAM has additional appeal as a basis for simple macro-meso level analysis and multiplier modelling. Nevertheless there are some important limitations that should be borne in mind by a new analyst.

First, there is no single, definitive SAM: the framework is flexibly set around a standard core structure. The detailed classifications should be chosen according to country-specific criteria; to best reflect the economy in question. This means that it is quite possible to compile a SAM readily and without too much difficulty given the main data ingredients, using the (by now) standard procedures described above. However, to be really informative, the mapping of income around the system needs to be relatively detailed and complete, otherwise the information content will be constrained by the weakest link in the chain.

Secondly, it should be emphasised hat it is not always possible to use the data sets without a certain amount of adjustment. For instance, because the national accounts are not always compiled from household survey data it is not easy to rationalise the two data sources, and this applies not only to household expenditures but also (and especially) to incomes. Although the tendency is to calibrate a disaggregated SAM to a macro SAM that is consistent with the national accounts, it may well be that it is the national accounts that ought to be adjusted in some circumstances.

Thirdly, SAM-based multiplier models do have a role to play in examining the nature of the socio-economic structure of an economy. Their main virtue is simplicity and transparency, and the decomposition analyses certainly assist further. The models provide a simple structure for examining the potential effects of exogenous policy (or external) shocks on incomes, expenditures and employment, etc, of different household groups, in a fixed price setting. It is tempting to assume that these models work out the broad orders of magnitude and directions of effect. But whether they do so depends crucially upon whether the underlying assumptions are met. There are circumstances when they are not. If an economy is constrained or faces bottlenecks in any sector, in the supply of goods or services, or in key factors of production, then the multiplier analysis needs to be viewed with caution. Also, multipliers are only useful in examining the real-side effects of quantity-based shocks, they are not at all good at handling price shocks or ascertaining price effects.

Box 14.1 Relationship between SAMs and the National Accounts

It is highly desirable that a SAM should be consistent with the national accounts; and an aggregate SAM is a particular way of representing the national accounts within a matrix framework. This is sometimes referred to as a 'macro SAM', although it has few of the socio-economic details and features of a true meso-level SAM.

The System of National Accounts (SNA, 1993) is an international system that is now in the process of being implemented by many developing countries. It is based around a set of Integrated Economic Accounts (IEA) defined by transactor (i.e. institutional sector). There are sets of current accounts, accumulation accounts, and balance sheets. In common with current national accounting practice most of the detailed estimates are compiled for the current accounts, and with only summary accumulation accounts, that is flow accounts. As yet, the balance sheets, recording the changes in the values of stocks of assets and liabilities held by institutions, are rarely estimated for countries. Each flow account in the system tracks a particular kind of economic activity such as production, or the generation, distribution, redistribution and use of income. In each account individual kinds of transactions are recorded by transactor of origin (resource) or destination (use), or both, and there is a balancing item that carries forward from one account in the sequence to the next. Thus, 'value added' is the balancing item in the production account, which is carried forward to the generation of income account; and 'disposable income' is carried forward from the (re)distribution of income account to the use of income account. It can be viewed as a system whereby income 'cascades' from one account to another. In this respect, although the SNA is not explicitly organised into a matrix format, there are features that can be helpful in deriving a SAM from it. But not all transactions are identifiable by origin and by destination, so additional work has to be done in deriving a full SAM, even confining it to the broad institutional level.

Preparing a more detailed SAM, highlighting detailed household groups and factor accounts, that is consistent with the national accounts is even more problematic (see Box 14.2). National accounting handbooks are now being prepared and are becoming available and are very helpful in providing a bridge between the national accounts and SAMs (Leadership Group on Social Accounting Matrices (2003).

Box 14.2 Constructing a SAM

The construction of a SAM with any significant degree of disaggregation of the principal accounts (activities, commodities, factors and households) requires the availability of some key datasets. Principally, these include:

- supply and use tables (input-output tables), or the necessary primary survey data to compile them.
- household survey incorporating a labour force survey (a multi-purpose, integrated household survey).
- government budget accounts, trade statistics and balance of payments statistics.
- national accounts.

If any components of these key datasets are not available then it precludes the construction of a fully comprehensive SAM. Not all surveys are necessarily available for the same year but if they are, or are available for a proximate year, then this usually provides sufficient usable information.

Many compilers begin by assembling a macro SAM from the national accounts. This defines a set of control totals for the subsequent disaggregations and means that the SAM Is consistent with any macro analysis. Often macro SAMs available for a more recent year than the detailed datasets; such as input-output tables, household surveys. Therefore the latter essentially provide shares to re-calibrate and fit to the macroeconomic aggregates.

In contrast, Pyatt and Round (1984) have pointed out that compiling detailed SAMs can be part of a process to improve the national accounts estimates. Many countries now re-base their national accounts periodically in accordance with a set of commodity balances (input-output table). Otherwise household survey data is not always fully utilised in estimating the national accounts (e.g. consumer expenditure is obtained as a residual in the commodity balances), so there might be a case for adjusting the macro SAM in some circumstances. One particular area concerns the coverage of subsistence and informal sector activities. Household surveys provide a unique source of information on this household sector activity. Nevertheless there are some continuing well-known problems in deriving estimates at the individual household, or even at the household group level, such as the tendency for respondents to underreport incomes and transfer income (Round, 2003).

Estimates from primary, or disparate secondary sources are often inconsistent and several alternative matrix balancing methods are available to adjust the initial estimates for consistency (see Byron, 1978; Robinson, Cattaneo and El-Said, 2001; and reviewed in Round, 2003). A good example of constructing a SAM is described in Chung-I Li (2002). Several similar examples can be found on the IFPRI website http://www.ifpri.org/ and Powell and Round (1998).

Table 14.1: A Basic Social Accounting Matrix (SAM)

ACCOUNT			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
Production	Commodities	(1)		Intermediate consumption		Household consumption		Government consumption	Fixed capital formation and change in stocks	Exports	Demand for products
	Activities	(2)	Domestic sales								Sales of commodities
Factors of production		(3)		Gross value added payments to factors						*Net* factor income from RoW	Factor income receipts
Institutions (Current accounts)	Households	(4)			Labour and mixed income	Inter-household transfers	Distributed profits to households	Current transfers to households	Labour and mixed income	*Net* current transfers from RoW	Current household receipts
	Corporate enterprises	(5)			Operating surplus			Current transfers to enterprises	Operating surplus	*Net* current transfers from RoW	Current enterprise receipts
	Government (&NPISHs)[1]	(6)	*Net* taxes on products			Direct taxes	Direct taxes			*Net* current transfers from RoW	Current government receipts
Combined capital accounts		(7)				Household savings	Enterprise savings	Government savings	Capital transfers	*Net* capital transfers from RoW	Capital receipts
Rest of World (combined account)		(8)	Imports						Current external balance		Aggregate receipts from RoW
TOTALS			Supply of products	Costs of production activities	Factor income payments	Current household outlays	Current enterprise outlays	Current government outlays	Capital outlays	Aggregate outlays to RoW	

Notes: NPISH: Non-profit institutions serving households

Source: Round (2003)

Table 14.2: SAM: Endogenous and Exogenous Accounts

ACCOUNT		Endogenous (1)	Endogenous (2)	Endogenous (3)	Endogenous (4)	Exogenous (5)	TOTAL
Commodities	(1)		Intermediate consumption		Household final consumption expenditures	Other final demands	Total demands for products
Activities	(2)	Domestic supplies					Total activity outputs
Factors	(3)		Value added			Factor income from abroad	Total factor income receipts
Households	(4)			Factor income to households	Inter-household transfers	Non-factor income receipts	Total household incomes
Other accounts (Exogenous)	(5)	Imports, Indirect taxes	Indirect taxes	Other factor payments	Savings, etc		Total exogenous receipts
TOTAL		Total supply of products	Total activity outputs	Total factor income payments	Total household outlays	Total exogenous payments	

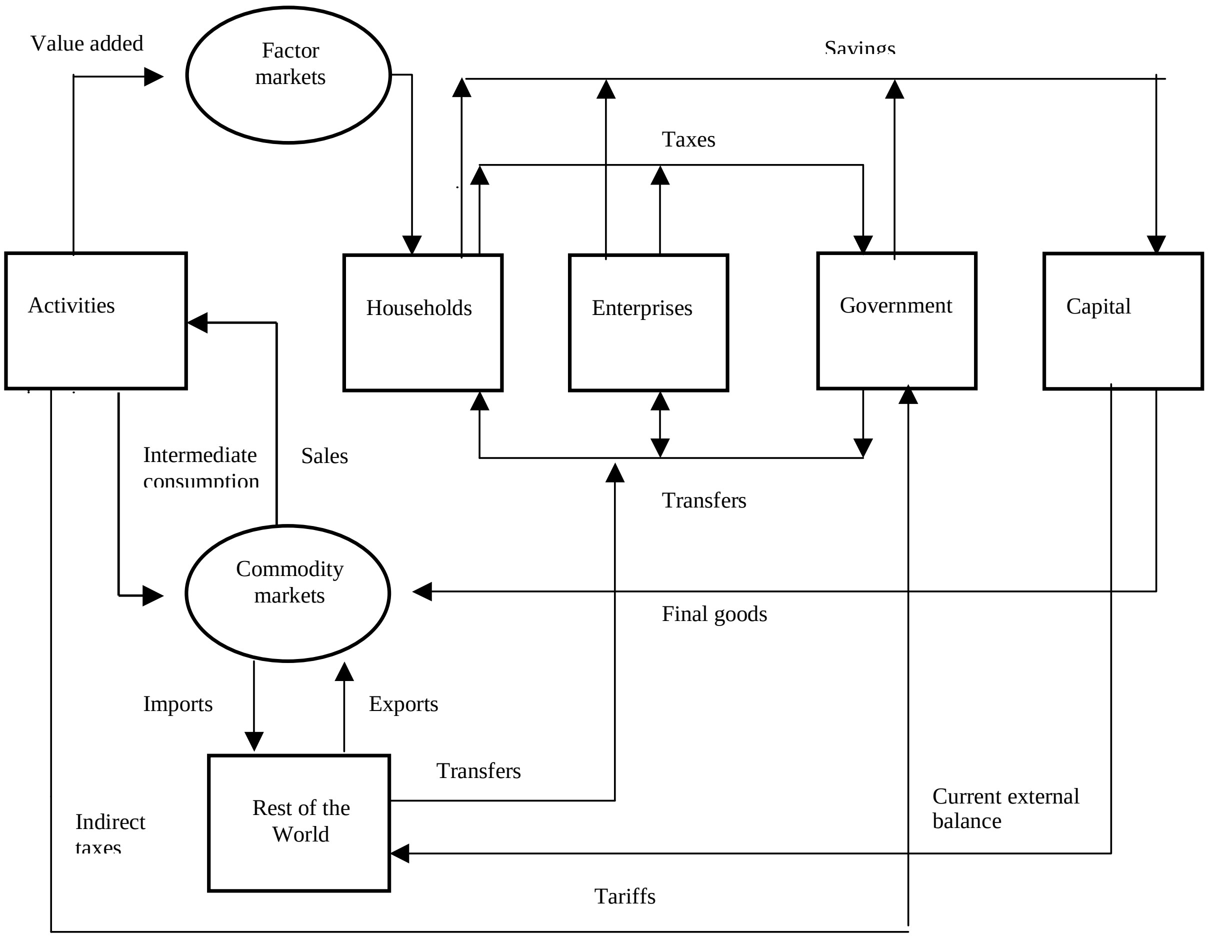
Commodities	(1)		T_{12}		T_{14}	x_1	y_1
Activities	(2)	T_{21}				x_2	y_2
Factors	(3)		T_{32}			x_3	y_3
Households	(4)			T_{43}	T_{44}	x_4	y_4
Other accounts (Exogenous)	(5)	l_1	l_2	l_3	l_4		Σl
TOTAL		y_1	y_2	y_3	y_4	Σx	

Table 14.3: **Selected multiplier effects derived from the Ghana SAM**
(Injections of 100 units of income)

Account in which injection originates	Account affected by injection	I	$M_1 - I$	$(M_2 - I)M_1$	$(M_3 - I)M_2M_1$	M
Cocoa	Employees: skilled/male			10	9	18
	Employees: unskilled/male			21	13	34
	Employees: skilled/female			1	1	3
	Employees: unskilled/female			4	2	6
	Mixed income			31	83	115
	Operating surplus			8	12	20
	Urban households			40	67	107
	Rural households			28	43	71
	Cocoa	100			7	108
	Total activity impact	100	62		244	406
Mining	Employees: skilled/male			9	6	15
	Employees: unskilled/male			17	8	25
	Employees: skilled/female				1	1
	Employees: unskilled/female			1	2	3
	Mixed income			9	50	58
	Operating surplus			32	7	40
	Urban households			22	41	63
	Rural households			17	26	43
	Mining	100	3		4	107
	Total activity impact	100	36		148	284
Education and health	Employees: skilled/male			33	11	44
	Employees: unskilled/male			15	15	30
	Employees: skilled/female			19	2	21
	Employees: unskilled/female			13	3	15
	Mixed income			1	101	102
	Operating surplus			13	15	28
	Urban households			50	81	132
	Rural households			32	52	84
	Health and education	100			9	109
	Total activity impact	100	14		296	410

Source: Extract from Powell and Round (2000); Table 5.

Fig 14.1 The economy-wide circular flow of income



Note: the arrows show direction of payments

Source: adapted from Chung-I Li (2002)

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