

Social Accounting Matrices

A Basis for Planning

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What Is a SAM?

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A social accounting matrix, familiarly known as SAM to the limited fraternity familiar with it, has two principal objectives. The first is concerned with the organization of information, usually information about the economic and social structure of a country in a particular year, though it could as well be about a region in a country, a city, or any other unit one is interested in; the unit of time, though convenient, is arbitrary. Complaints about the inconsistency and unreliability of economic and social data in developing countries have reached the point of being trite. Although there is justification for these complaints, they are not the whole story. There is often information, dispersed or fragmentary, which is not used for lack of a framework to make the maximum use of the available information and to pinpoint with greater accuracy and specificity the salient gaps and inconsistencies.

Once the data in a particular country for a particular year have been organized in the form of a SAM, they present a static image which can reveal much about the country's economic structure. Even so, the image is only a "snapshot." In order to analyze how the economy works and to predict the effects of policy interventions, more is needed than just a static image. A model of the economy has to be created which can simulate, for example, the effects of interventions. This is the second objective of a SAM: to provide the statistical basis for the creation of a plausible model.

The principle of a SAM is really nothing more than that of double entry bookkeeping in accounting. A SAM is a series of accounts in each of which incomings and outgoings (or income and expenditure in many cases) must balance. What is "incoming" into one account must be "outgoing" from another account. In this respect, a SAM resembles traditional national accounts. In fact, as will be demonstrated later, a SAM embodies the information normally included in national accounts and much more. In a SAM the double entries are achieved by only a single entry in a matrix which resembles an oversized chessboard. Each account consists of one row across the board and one column down it; both are identically numbered. We shall explain how this works shortly.

How large the matrix is depends on the limitations of the available data and the motivation one has for constructing it. In principle, there is no limit to the fineness of detail. In practice, both the data and the effort available for constructing the SAM impose limitations. One of the original motivations for the elaboration of SAMs has been the growing interest in issues of poverty and basic needs. If one wishes to show how different activities affect or are affected by different socioeconomic groups in society, the amount of detail must correspond to the differentiation one wishes to make.

This paper does not attempt to examine the problems arising in the construction of SAMs or the methods of economic analysis which use the assembled data. It is not addressed to specialists but to the broader audience of those who need an introduction to SAMs. In the rest of the paper we shall proceed with simplified examples of SAMs, based on more elaborate ones published elsewhere. We shall start at the simplest level with a purely imaginary economy and proceed by increasing the size and the complexity with examples of SAMs worked out for real economies, Sri Lanka and Botswana. The reason for using two different vehicles, rather than

Table 1.1. The SAM for Robinson Crusoe

			Expenditures					Total
			1	2	3	4	5	6
Receivers	1	Income				1,000		1,000
	2	Demand	1,000					1,000
	3						
	4	Production		1,000				1,000
	5						
	6	Total	1,000	1,000		1,000		

carrying the reader nonstop on one, is that they illustrate the fact that SAMs may be constructed in different ways—or, more properly, with different accents—for different purposes. Some points of interest may occur in one and others in another.

A PRIMITIVE EXAMPLE: THE ROBINSON CRUSOE ECONOMY

As an expository device, the Robinson Crusoe economy has perhaps become rather shopworn. Nevertheless, for want of something better, we shall use it again as a point of entry into the description of SAMs. We shall assume that Robinson Crusoe engages in only one production activity, the picking of coconuts. In some given period, he picks 1,000 coconuts. This represents at the same time the level of production, the level of his income, and the level of his demand for products (sometimes called "wants"). All three are equal, as they must be in such an economy.

The structure of this economy is set out in table 1.1, in which two columns and rows have been left blank because they are not being used for the time being. The final column and row around the border show the total of each row or column. Within the border there are three entries, each of them equal to 1,000. These constitute the SAM for Robinson Crusoe.

In a SAM the rows represent incomings and the columns outgoings. For example, row 1, which is labeled "income," receives 1,000 from column 4, labeled "production." In other words, Robinson Crusoe's income derives from production and equals 1,000. Now, turning to column 1, we see the corresponding entry 1,000 which represents the outgoings of income in row 2, which is labeled "demand." Column/row 1, in effect, describes Robinson Crusoe's role as an income earner.

In column/row 2, we look at him as a consumer. His demand arising from income in row 2 is balanced by what he spends on production in column 2 (row 4). The third leg of this process is in row 4 and column 4, where he turns up a third time as producer: his demand for production is 1,000 and income arising from production is also 1,000. These various identities could be set out in the form of double entry accounts, but, although not so apparent yet, the matrix is more economical since it requires one entry for each item, whereas conventional accounts require two.

It will be noted that there is a circular process. If one put the three entries in the table in coordinate form with the row first and column second, they would appear like this: (1, 4); (4, 2); and (2, 1). Thus, the matrix illustrates the circular process of demand leading to production leading to income, which in turn leads back to demand.

Of course, this rather complicated way of setting out the trivial structure of the Robinson Crusoe economy might well be considered much ado about nothing. We present it this way, however, because it is so self-evident and can serve as an introduction to the more complex relationships in an actual economy. In real life, Robinson Crusoe as a member of a society may, indeed, fill all three roles—as income earner, consumer, and producer—but he would do so as a member of different sorts of units or subdivisions, according to his function. In the accounts for a whole society, income may be subdivided into many different categories, among which income to labor and income to capital are only the first tier. That income accrues to a variety of domestic institutions, which are the source of demand: households with different characteristics, firms, and government (central or local). The outgoings or expenditures of these institutions are spread over a variety of products, as indeed Robinson Crusoe's must have been; production thus can be divided into as many sectors or subsectors as is desirable or practical. In the next section, we turn to a description of a SAM which has been worked out for an actual economy. Although progressive complexities are brought in, the fundamentals remain the same.

Table 1.2. An Initial Aggregate SAM for Sri Lanka, 1970
(in millions of rupees)

		Expenditures					Total
		1	2	3	4	5	
R e c e i p t s	1	Factors of production				11,473	11,473
	2	Institutions	11,360			885	97
	3	Surplus or deficit		-425			425
	4	Production		11,312			2,113
	5	Rest of the World	113	1,455		1,067	2,635
	6	Total	11,473	12,342	0	13,425	2,635

SRI LANKA 1970

Among the first SAMs constructed was that for Sri Lanka. Sri Lanka is a country with a low average income per capita, but an unusually equitable distribution of income and high standards in meeting "basic needs." Having successfully achieved a high quality of life for such a low income, Sri Lanka's need for more rapid growth of income and reduction of unemployment implied structural change; it also implied better understanding of the existing economic structure.

All the data used in this section are taken or adapted from one of the earliest publications documenting the construction of a SAM (Pyatt and Thorbecke, 1976). We start with a highly aggregated and simplified version, shown in table 1.2. In this table all six pairs of rows and columns are used, although one of them (3) has no entry in the column. Apart from the border totals, there are now eleven entries. Two of the titles used in the Robinson Crusoe economy were not the conventional ones used in SAMs, because in such a primitive economy they would have sounded rather fatuous. Column/row 1 is now called "factors of production" and column/row 2, "institutions." A word of explanation is in order about these two fundamental ingredients of a SAM. Factors of production consist primarily of the labor and capital that are used in the process of production and receive income from it. But the production process draws these factors from where it can, without being overly concerned with the entities to which their owners belong. It is these entities that constitute the "institutions" in column/row 2. Foremost among them are households, which we may wish to study in different categories. Households may supply labor and capital through one or more of their members but act as a unit when it comes to spending the income from it. Other institutions are firms or corporations, both public and private, which provide capital. A third type of institution is government, central or local. It, too, may provide capital, but it has another important role in the production process—at least in the determination of the value of production—namely, the levying of indirect taxes. (It will be noted that these are all domestic institutions.)

The two new accounts 3 and 5 (that is, the pairs of row and column) are there for different reasons. The account for the "rest of the world" (5) is necessary because Sri Lanka, though an island, is not an isolated one like Robinson Crusoe's, but has many transactions with the rest of the world. The "surplus or deficit" (3) is a direct consequence of these transactions; the transactions are normally not equal and must be balanced by borrowing or lending, or by the use of reserves. How these two new accounts fit in will be explained in a tour of the matrix.

We shall start with the production account (4). In the row are the "incomings": the proceeds of sales, at producers' prices, of 11,312 to institutions within Sri Lanka in column 2 and of exports of 2,113 to the rest of the world in column 5. These are exactly balanced by the "outgoings" or the cost of production in column 4: in row 5 payments of 1,067 for imports of materials going into production; in row 2 payments of 885 made to institutions during the production process, which are in fact indirect taxes on intermediate goods or imported materials; and finally, the value added by factors of production of 11,473 in row 1. (All figures in this section are in millions of Sri Lankan rupees.)

If we move to the income account (1), the 11,473 just referred to is now interpreted as income to factors of production (again not differentiated as yet). In column 1 we see the disposition of this income to factors of production, consisting mainly of income of 11,360 accruing to institutions in Sri Lanka and the small balance of 113 to the rest of the world.

Moving now to the third main account—the one for institutions—we have in row 2 two incoming items already mentioned: income from factors of production (11,360) in column 1 and indirect taxes (885) in column 4. There is one additional receipt—transfers from the rest of the world (97) in column 5. The components of this will be described later.

Column 2 shows how the receipts of institutions are spent. In rows 4 and 5 there are goods

Table 1.3. A Revised Aggregate SAM for Sri Lanka, 1970
(in millions of rupees)

			Expenditures					Total
			1	2	3	4	5	6
R e c e i p t s	1	Factors of Production				11,473		11,473
	2	Institutions	11,360	2,441		885	97	14,783
	3	Surplus or Deficit		-425			425	0
	4	Production		11,312		4,660	2,113	18,085
	5	Rest of the World	113	1,455		1,067		2,635
6		Total	11,473	14,783	0	18,085	2,635	

and services purchased: 11,312 being the value of goods produced in Sri Lanka, and 1,455, the value of goods imported in final form as opposed to those used as materials in the course of production. In addition, in row 3, the deficit of -425 is due to the fact that expenditure by institutions in Sri Lanka exceeds their receipts.

In the course of this brief tour, we have now referred to every item in the two new accounts, 3 and 5, with one exception. This is the surplus of 425 in row 3 of the account of the rest of the world (5). The latter's total income in the row exceeds its expenditure in the column by this amount; the rest of the world's surplus exactly balances Sri Lanka's deficit. Consequently, Sri Lanka had to borrow or use its reserves to cover its deficit of 425 with the rest of the world.

It is worth noting that the three largest entries in the matrix, by a wide margin, are in boxes (2, 1), (1, 4), and (4, 2); these were the only entries in the Robinson Crusoe SAM. The core of the matrix is still the circular process of demand (2), production (4), and income (1). Most of the remainder are required by the existence of the rest of the world. The circular process is dual in nature. One can move round a circle clockwise or counterclockwise. If we go in the counterclockwise direction, corresponding to the order just given, we are implicitly following the flow of money. In (1, 4), factors of production, such as labor, receive money from production; in (2, 1), institutions, such as households, receive money from factors of production; and in (4, 2), production receives money from institutions. We may think of the other direction as the supply of goods or services: factors of production to the production process, production to institutions, and institutions (by a slight stretch of the meaning) to factors of production.

We can now give an example of how the SAM could be set up in the form of double entry accounts, of which there would be five. For example, the production account shows:

<u>Revenue (row)</u>	<u>Expenditure (column)</u>		
Domestic sales	11,312	Payments to factors of production	11,473
Exports	2,113	Indirect taxes (on production)	885
		Imported materials	1,067
Total	13,425	Total	13,425

This is more or less the form of traditional national accounts. The complete accounts are fully articulated in this double entry form in the sense that each item in one account appears on the opposite side of another account. It can be readily appreciated that, as the number of accounts is multiplied, their interconnections can become rather hard to follow. A SAM is more economical in that it has only half as many entries as a series of double entry accounts, and the interconnections between accounts are obvious.

Diagonal Entries

There are two modifications to table 1.2 in the next version—table 1.3. Both are diagonal entries: one at (2, 2) and the other at (4, 4). Nothing else in the table has been changed except, of course, the totals for rows/columns 2 and 4, which are each increased by the amount of the corresponding diagonal entries.

What meaning is attached to a diagonal entry, which appears both as a revenue and as an expenditure to a particular account? It clearly can only mean that, in one case, institutions make certain payments to themselves or, in the other case, production units do the same. If we were only concerned with institutions or production units as a group, this would not serve much purpose. But that is not the case. In fact, we shall in due course split both accounts into several subaccounts. The diagonal elements represent the total of transactions among these subaccounts plus new diagonal elements within the subaccounts themselves, if they too are aggregations.

By including diagonal entries, we have changed the meaning of the totals. In table 1.2, the total of column 4 was the total value of all goods and services (value added in Sri Lanka plus

Table 1.4. Further Development of the Aggregate SAM for Sri Lanka, 1970
(in millions of rupees)

			Expenditures					Total
			1	2abc	2d	3	4	
R e c e i p t s	1	Factors of production					11,473	11,473
	2abc	Institutions	11,360	2,052	1,368			14,783
	2d	Indirect taxes		389			885	94 1,368
	3	Surplus or deficit		-425				425 0
	4	Production		11,312			4,660	2,113 18,085
	5	Rest of the World	113	1,455			1,067	2,635
	6	Total	11,473	14,783	1,368		18,085	2,635

import content) produced in Sri Lanka without duplication. In table 1.3, it represents the sum of the outputs of all production units. There is duplication in this sum to the extent that one production unit sells to another; the diagonal entry is the amount of this duplication. Similarly, the diagonal amount of 2,441 in row/column 2 represents moneys paid from one institution to another. Such transfers are a part of total incomes and total expenditures.

Indirect Taxes

In table 1.4 we have made an initial split in the institutional account (2). Instead of one line, there are now two: 2abc (foreshadowing further splits into 2a, 2b, and 2c), which we have given, rather lamely, the same title as before; and 2d, which is labeled indirect taxes. Part or all of each of the entries in the old line 2 have been extracted and entered on line 2d. Thus in column 2abc the original figure of 2,441 has been split into two entries, 2,052 and 389; in column 4 the old entry of 885 is now on line 2d; and the old entry in column 5 has similarly been split up. The amounts so extracted from row 2 have been replaced by a single figure equal to the sum of the parts extracted—1,368 in column 2d. Consequently, the total for row (and column) 2abc is the same as before.

Why do we need a separate account for indirect taxes? The main reason is that they should be distinguished from direct taxes. The latter are extracted from the income stream and, therefore, constitute a transfer to the government from other institutions. Indirect taxes, on the other hand, are levied on the expenditure of the final purchaser of goods and services or, earlier in the production chain, on intermediate goods purchased by producers. In column 2 of table 1.3, the total cost of goods purchased at home (11,312) and abroad (1,455) is not what the buyer pays. Indirect taxes (or their opposite, subsidies) must be added in (or subtracted). The same is true for exports in column 5. The symmetry with column 4, where indirect taxes on intermediate goods or materials are clearly separated, should be evident.

At the same time indirect taxes, which appear as an expenditure in columns 2, 4, and 5, are also a source of revenue to the government (one of the institutions of Sri Lanka) and so appear in column 2d on the appropriate row (2abc).

Of course, indirect taxes are not an "institution" in any reasonable sense. But separating them out has sufficient advantage in understanding the structure to justify a separate subaccount. The logic of the matrix is in no way altered. The total still appears as part of the revenue of the government, while the parts are allocated to the relevant types of expenditure. This is an illustration of the flexibility of a SAM. (And here it can be noted that another way of dealing with indirect taxes, which may be preferable in some contexts, is to insert all of them into the production process, column 4.)

Savings and Investment

Before proceeding to a subdivision of the various accounts, we will make one more change. In column 2 (or 2abc) expenditure so far has included all kinds of goods and services, whether for consumption or investment. The change introduced in table 1.5, in effect, separates consumption from investment goods. Column 2abc now becomes a true current account for institutions and has been so labeled.

The initial change is a reallocation between columns 2abc and 3. We extract the investment goods in rows 4 and 5 from column 2abc and enter them in column 3, renamed "combined capital account." For example, in row 4, the entries in columns 2abc and 2d—9,350 (consumption goods) and 1,962 (investment goods)—correspond to the total 11,312 in row 4 of table 1.4. The related indirect taxes similarly shift on row 2d. There is also a small shift on row 2abc

Table 1.5. A Final Aggregate SAM for Sri Lanka, 1970
(in millions of rupees)

			Expenditures					Total
			1	2abc	2d	3	4	
R e c e i p t s	1 2abc 2d 3 4 5	Factors of Production Institutions: Current Indirect taxes Combined Capital Production Rest of the World Current					11,473	11,473
			11,360	2,009	1,368	43		14,783
				119		270	885	94
					2,214			425
					9,350	1,962	4,660	2,113
			113	1,091		364	1,067	2,635
	6	Total	11,473	14,783	1,368	2,639	18,085	2,635

for institutional reasons which are specific to Sri Lanka and do not merit detailed explanation here.¹

The total of all these changes in column 3 is equal to expenditure on investment—namely 2,639. Expenditure in column 2abc is now reduced by this amount. The balance of -425, which formerly appeared on line 3, is altered accordingly by the amount spent on investment: -425 + 2,639 = 2,214. This is now the difference between income and current expenditure or consumption rather than income and total expenditure. It constitutes the savings of domestic institutions. Total savings derive from domestic sources (2,214) and foreign sources (425). These together finance investments (account number 3). In double entry form, the combined capital account is:

<u>Revenue (row)</u>		<u>Expenditure (column)</u>	
Domestic savings	2,214	Domestic investment goods	1,962
Foreign savings	425	Foreign investment goods	364
		Indirect taxes	270
		Other payments	43
Total	2,639	Total	2,639

A General Framework

In table 1.6 we have divided two accounts (1 and 2) into subaccounts. The account for factors of production (1) is divided according to the two main factors: labor (1a) and capital (1b). In account number 2, the three main sets of institutions have been distinguished: households (2a), corporations (2b), and government (2c). Indirect taxes (2d) had already been separated in table 1.4.

There is little to say about the subaccounts for factors of production, which show income to labor and capital separately. Income to capital is more than half the total, but, as will be seen from column 1b, the greater part of it accrues directly to households. This consists largely of income from small enterprises including farms, plus a substantial element of imputed income from housing.

The entries in the "box" bounded by rows and columns 2a, 2b, and 2c are in the aggregate equal to the diagonal entry (2, 2) in table 1.5. Payments among institutional sectors all fall into the category of transfer, since they do not constitute income directly received from production. Payments arise from a variety of causes: ownership of certain assets (such as debt or equity investment in firms), direct taxation or government subsidies to households (not related to goods or services), or even voluntary transfers. Payments to the government include, of course, direct taxes by both households and corporations, but they also include social security contributions, pension fund contributions (actual or imputed), and dividends and the like from corporations (mainly public ones in Sri Lanka). Payments by the government include pensions, interest on the public debt, and a substantial amount of direct transfers to public corporations. The large payments from corporations to households (2a, 2b) are mainly payments to owners of capital (debt or equity), although they include some private corporate pensions.

It will be noted in this table that, on line 4, there is no entry for consumption in column 2b (corporations). Following standard national accounting practice, only households and the government consume. Goods and services used by firms as inputs in the course of production are included in the final value of output; they are only consumed when the final output is consumed. Firms may invest, but their investments are included in column 3.

Some observations are in order about some of the other accounts. We can see why account 3

1. They have to do with the system of Foreign Exchange Entitlement Certificates (FEECs), a system granting or charging a premium for foreign exchange, here applied to debt payments.

Table 1.6. A Partially Disaggregated SAM for Sri Lanka, 1970
(in millions of rupees)

			Expenditures								Total	
			1a	1b	2a	2b	2c	2d	3	4	5	6
R e c e i p t s	1a	Income to Labor								5569		5569
	1b	Income to Capital								5904		5904
	2a	Household Current	5569	4216		644	248				18	10695
	2b	Corporations Current		1575			294				-15	1854
	2c	Government Current			447	376		1368	43			2234
	2d	Indirect taxes			119				270	885	94	1368
	3	Combined Capital			1337	834	43				425	2639
	4	Production			7701		1649		1962	4660	2113	18085
	5	Rest of the World		113	1091				364	1067		2635
	6	Total	5569	5904	10695	1854	2234	1368	2639	18085	2635	

is now labeled "combined capital account." It combines the capital accounts of households, corporations, government, and the rest of the world. In principle, there is no reason why each institution should not have a capital account of its own. In practice, this was not possible in this case because of data limitations. Later, we will show an example of a disaggregated capital account in another SAM.

The production account (4) has not yet been subdivided. The blank lines suggest, correctly, that it will follow in the next table. The principal reason for not dividing it at this stage is that we do not wish to make too many changes at once. There is also another reason. The SAM in its present form gives all the information necessary to compile the "Consolidated Accounts for the Nation" as outlined under the UN SNA system (United Nations Statistical Office, 1968, p. 29). The accounts in this form are set out in table 1.7. They do not contain any information that is not already included in table 1.6. The latter is therefore a more compact form in which to present these consolidated accounts. It also, perhaps, is more useful insofar as the interconnections among accounts are more obvious in table 1.6 than they are in the double entry format.

Each of the consolidated accounts can be identified with either a single column or row in table 1.6, or a combination of both. The two accounts which correspond to a single column/row can easily be compared. The capital account (c) corresponds to column/row 3; the rest of the world account (d) corresponds to column/row 5. Outgoings in the consolidated accounts correspond to columns and the incomings to rows. The other two accounts are less easy to identify, since they correspond to combinations. The reader who is not interested in the details of the identification is advised to skip the next five paragraphs.

The "domestic product and expenditure" account (a) corresponds to SAM accounts 2d and 4 combined, with two adjustments. In order to show the correspondence, we have reproduced in table 1.8 rows/columns 2d and 4 of table 1.6 and added the implications of making the adjustments, as described below.

First, the elements common to both row combination and column combination have been omitted; these are the figures 885 in row 2d and 4,660 in row 4 of column 4 in table 1.6. They can be left out because, when accounts 2d and 4 are combined, as they need be to form the domestic product and expenditure account, all transactions between accounts 2d and 4 become both a receipt and an expenditure of the combined account. They therefore do not affect the balance of receipts and expenditures for the domestic product and expenditure account.

Second, we have added an extra row and column, 7, which does not appear as such in table 1.6. The row corresponds to direct imports for final consumption and for investment. (The figures 1,091 and 364 appear in row 5 in table 1.6.) The column has the total 1,455 required to balance the account.

Row 8 in table 1.8 is the sum of the combined entries in rows 2d, 4, and 7. This row corresponds to the incomings, or the left side of consolidated account (a), except for the imports, which have in effect been transferred, changing the sign, from the opposite side. Column 8 includes these imports and the outgoings, or the right side of account (a).

The "national disposable income and outlay" account (b) corresponds to SAM accounts 2a, 2b, and 2c. Table 1.6 has been reproduced with only these rows and columns in table 1.9, but the diagonal transfer elements between them have been eliminated. Here we represent the totals by two rows and columns, 8a and 8b, instead of one, because, in several cases, the simple addition of the elements in a particular combination does not correspond to an entry in the consolidated account (c). For example, income to capital in column 1b appears not as the sum of 4,216 and 1,575 (5,791) but as the difference between total capital income (5,904) and capital income to the rest of the world (113); that the two are the same is obvious from column 1b in table 1.6. In column 8b, the three elements of private consumption marked by an asterisk appear combined in consolidated account (b) of table 1.7: indirect taxes (119), domestic production (7,701), and imports (1,091), making a total of 8,911. Once one has performed these

Table 1.7. Consolidated National Accounts for Sri Lanka, 1970
(in millions of rupees)

A. Domestic Product and Expenditure

<u>Incomings</u>	<u>Outgoings</u>
Government consumption 1,649	Income to labor 5,569
Private consumption 8,911	Income to capital 5,904
Investment 2,596	Indirect taxes 1,368
Exports 2,207	
<u>Less Imports</u> -2,522	
12,841	12,841

B. National Disposable Income and Outlay

<u>Incomings</u>	<u>Outgoings</u>
Income to labor 5,569	Government consumption 1,649
Income to capital 5,904	Private consumption 8,911
Indirect taxes 1,368	Savings 2,214
Current transfers from abroad 3	
Transfers from capital a/c 43	
<u>Less property income transferred abroad</u> -113	
12,774	12,774

C. Capital Account

<u>Incomings</u>	<u>Outgoings</u>
Savings 2,214	Capital formation 2,596
<u>Less transfers from capital a/c</u> -43	
Foreign borrowing 425	
2,596	2,596

D. Rest of the World Account

<u>Incomings</u>	<u>Outgoings</u>
Imports 2,522	Exports 2,207
Property income transferred abroad 113	Transfers 3
2,635	Surplus (of ROW) 425
	2,635

Note: ROW signifies rest of world

Table 1.8. Reconciliation Table for Sri Lanka, 1970
 (in millions of rupees)

	1a	1b	2a	2b	2c	2d	3	4	5	7	8
1a Incomes of Labor							5569				5569
1b Income to Capital							5904				5904
2a Household Current											
2b Corporations Current											
2c Government Current						1368					1368
2d Indirect Taxes			119				270		94		
3 Combined Capital											
4 Production			7701		1649		1962		2113		
5 Rest of the World								1067		1455	2522
7 Final Imports			1091				364				
8 Subtotal			8911		1649		2596		2207		15363

Note: Column 8 is the total of columns 2d, 4, and 7. Row 8 is the total of rows 2d, 4, and 7.

Table 1.9. Revised Reconciliation Table for Sri Lanka, 1970
(in millions of rupees)

		1a	1b	2a	2b	2c	2d	3	4	5	8a	8b
1a	Incomes to Labor											
1b	Income to Capital											
2a	Household Current	5569	4216							18		
2b	Corporations Current			1575						-15		
2c	Government Current					1368	43					
2d	Indirect taxes			119								119*
3	Combined Capital			1337	834	43				2214		
4	Production			7701		1649				1649	7701*	
5	Rest of the World			1091								1091*
8a		5569	5904				1368	43	3			
8b				-113								(12774)

Note: Columns 8a and 8b together equal the total of columns 2a, 2b, and 2c. Rows 8a and 8b together equal the total of rows 2a, 2b, and 2c.

*The total of these three equals 8,911 (private consumption).

arithmetic tricks, the elements in the row again correspond to the consolidated account incomings and the column to outgoings.

An Input-Output Matrix

The final step in this exposition of the Sri Lanka table is to subdivide the production account (4) into six sectors; these are listed in table 1.10 in rows 4a to 4f. The "box" formed by these rows and their equivalent columns constitutes the core of what is commonly known as an input-output matrix. The accounts of each sector follow essentially the same logic as before.

For example, if we take the agricultural sector (4a), the column in total is equal to gross output at producers' prices (which exclude sales taxes and the like). This total of 5,903 includes not only value added (in rows 1a and 1b), taxes on intermediates (in row 2d), and imported materials (in row 5), but also inputs from other sectors. The largest volume of inputs is on the diagonal (4a, 4a) and consists of internal purchases and sales within the sector; in fact, it is largely paddy (one subsector) sold to ricemills (another subsector).

Just as column 4a shows the sources of gross output to which payments are made, row 4a shows the destinations of gross output from which the production units derive their revenue: in column 2a the amounts going to consumption; in column 3 to investment; in columns 4a to 4f as intermediate goods to other sectors; and in column 5 to exports.

Table 1.10, with eighty-five entries in it, is a long way from the pristine simplicity of the Robinson Crusoe economy. The circularity of the process of production-income-expenditure is no longer so evident. But this fundamental attribute of the SAM is still there, and it can be illustrated by reference to the input-output tables. Table 1.11 shows an input-output table with six sectors corresponding to those in table 1.7. Table 1.11 is the same as table 1.10, with two exceptions. The first, which is trivial in substance, is that it has been rearranged. Columns and rows 4a to 4f in table 1.10, which were in the lower right corner, occupy the top left corner in table 1.11; columns and rows 1, 2, and 3 are now below or to the right of them. The substantial difference is that the lower right corner of table 1.11 is blank. The input-output table captures only the relationships between the production accounts and the other accounts (factors of production, institutions, capital accounts, and rest of the world). Interrelationships among these accounts, most of which are in the top left corner of table 1.10, are not there.

If we were to specify a new set of final demands different from those in table 1.11, techniques, based on specific assumptions about intersectoral relationships, exist for deriving the implied pattern of production in each subsector. That implied pattern, of course, will include income to factors of production (rows 1 and 2 in table 1.10). The results, however, give no guarantee that there is any relationship between incomes generated and the ensuing demand. The complete SAM, in principle, provides the missing link—or at least the data to establish it.

Table 1.10 is as far as we shall go here in subdividing the accounts. In the original source, much greater detail is shown. In one complete matrix, the following appear:

- Three labor groups (urban, rural, and estate)
- Three capital groups (public, private, and housing)
- Three household groups (urban, rural, and estate)
- Two kinds of corporations (private and state)
- Eleven production sectors.

However, still more detail lies behind that matrix. For example, the production account is based on detailed accounts for forty-eight subsectors. Household data are based on information for six income brackets within each group.

This completes the first part of this introduction to the exposition of social accounting matrices. For those who may, unexpectedly, have been titillated by the subject, we have added one more section on a SAM for a different country, Botswana. That example illustrates an attempt to

Table 1.10. A Complete Disaggregated SAM for Sri Lanka, 1970
(in millions of rupees)

		Expenditures													Total		
		1a	1b	2a	2b	2c	2d	3	4a	4b	4c	4d	4e	4f	5	6	
R	1a	Income to Labor							2015	561	245	909	564	1275		5569	
e	1b	Income to Capital							2009	909	734	1423	829			5904	
c	2a	Household Current	5569	4216		644	248								18	10,695	
i	2b	Corporations Current		1575			294								-15	1854	
p	2c	Government Current			447	376		1368	43							2234	
t	2d	Indirect taxes			119				270	80	504	66	130	76	29	1368	
s	3	Combined Capital			1337	834	43								425	2639	
3	4a	Agriculture			2861				104	1191	354	3		62	40	1288	5903
4a	4b	Industry			1824				109	254	815	417	172	66	74	335	4066
4b	4c	Construction						1595		1		7	50	92		1745	
4c	4d	Trade and Transport			1606				154	135	344	206	96	42	59	203	2845
4d	4e	Private Services			1410					37	4	9	38	55	37	287	1877
4e	4f	Government Services				1649										1649	
4f	5	Rest of the World		113	1091				364	182	574	65	70	133	43		2635
5	6	Total	5569	5904	10,695	1854	2234	1368	2639	5903	4066	1745	2845	1877	1649	2635	

Table 1.11. Input-Output Matrix for Sri Lanka, 1970
(in millions of rupees)

	Sectors						Sub- Total	Final Demand				Total
	Agr.	Ind.	Constr.	Trade & Transp.	Priv. Services	Govt. Services		Cons.	Inv.	Gov't.	Exports	
Agriculture	1,191	354	3		62	40	1,650	2,861	104		1,288	5,903
Industry	254	815	417	172	66	74	1,798	1,824	109		335	4,066
Construction			1		7	50	92	150		1,595		1,745
Trade & Transport	135	344	206	96	42	59	882	1,606	154		203	2,1845
Priv. Services	37	4	9	38	55	37	180	1,410			287	1,877
Govt. Services							0			1,649		1,649
Subtotal	1,617	1,518	635	313	275	302	4,660	7,601	1,962	1,649	2,113	18,085
Value added (labor)	2,015	561	245	909	564	1,275	5,569					
Value added (capital)	2,009	909	734	1,432	829		5,904					
Indirect taxes	80	504	66	130	76	29	885					
Imports	182	574	65	70	133	43	1,067					
Total	5,903	4,066	1,745	2,845	1,877	1,649	18,085					

Table 1.12. An Aggregate SAM for Botswana, 1974-75
(in millions of pulas)

		Expenditures							Total	
		1	2	3	4	5	6	7		
R e c e i p t s	1	Factors of production		29.2	171.4	23.0			0.7	224.3
	2	Institutions Current Account	220.7	80.6	4.5	18.3	4.6	2.0	330.7	
	3	Production Account		78.0	82.8	117.9	68.4	2.7	349.8	
	4	ROW Current Account	3.8	87.2	91.4		37.0	9.2	147.7	
	5	Combined Capital Account		55.4		69.4		-8.3	116.5	
	6								
	7	Errors and Omissions	-0.2	0.3	-0.3		6.5		6.3	
	8	Total	224.3	330.7	349.8	228.6	116.5	6.3		

Note: ROW signifies rest of world.

bring into the framework of the accounts not only the various transactions already described but also the financial counterpart of these real transactions and the flow of capital funds into investment. In some ways this is one of the most intriguing uses of a SAM, because it brings together two related aspects of development, the real and the financial. The parsimonious use of financial data and the neglect of its relationship with the real economy have often been noted (see chapter 3).

BOTSWANA 1974-75: THE FLOW OF FUNDS

Our purpose at this point is to illustrate how to introduce financial transactions into a SAM. The example we use is taken from a report on a SAM constructed for Botswana (United Kingdom, Ministry of Overseas Development, 1977). (All figures in this section are in millions of pulas.)

The Botswana SAM, shown as table 1.12, is conceptually the same as table 1.5 for Sri Lanka, except for three differences:

- There is no separate line for indirect taxes; for simplicity, they have been included with the central government, which is itself included under institutions (row/column 2).
- The combined capital account has been moved down to row/column 5 and the two accounts previously on lines 4 and 5 have been promoted to 3 and 4, respectively.
- New lines 6 and 7 have been added. One of them has been left blank for the moment. The other consists of errors and omissions. Totals are now shown in rows and columns 8.

The reason for not having a separate line for indirect taxes is to avoid unnecessary clutter. Having made the point once, we do not need to repeat it.

The change in order is not a change in substance, as there is no magic in any particular order. The best order is the one that follows a reasonable logic and makes the SAM intelligible to the reader; thus there can be differences. The order here conforms rather closely to the original, more detailed version of the SAM.

The account for errors and omissions (?) is present for two quite different reasons. The first set of errors is attributable entirely to rounding. Many individual figures in the original table have been added together to form subaggregates; this process inevitably involves rounding errors. There are, however, several large specific errors, which appear as such in the original SAM, mainly in rows/columns 4 and 5. These errors are akin to residual errors often left in the balance of payments or national accounts. All SAMs have such errors at some stage of their construction. How these particular errors arose and why they were left in are explained in detail in chapter 7.

Purchase and Sale of Assets

The main change in table 1.13 from table 1.12 is that row/column 6 has been labeled "financial account" with one entry each in the column and the row. In addition, there is a new diagonal element in row/column 5. These are basically the only differences.

All previous tables, whether on Sri Lanka or Botswana, have dealt with the consequences of current activity during the year: the production-income-expenditure cycle. Savings are savings out of current income, and the investment they finance encompasses only new investment. However, this does not exhaust the totality of transactions. Institutions may buy or sell existing physical assets, particularly land and buildings. They also lend or borrow, thereby creating financial assets or liabilities. The new entries are intended to acknowledge these facts.

The diagonal element of 30.3 in row/column 5 expresses the fact that institutions bought existing assets of that amount and also that they sold them. Obviously, the two must balance. When looked at as an entry in the column, the transaction appears as a purchase; when looked at as an entry in the row, it appears as a sale.

Table 1.13. Introduction of a Financial Account into the Aggregate SAM for Botswana,
1974-75
(in millions of pulas)

			Expenditures						Total	
			1	2	3	4	5	6		
R e c e i p t s	1	Factors of production		29.2	171.4	23.0			0.7	224.3
	2	Institutions Current Account	220.7	80.6	4.5	18.3	4.6		2.0	330.7
	3	Production Account		78.0	82.8	117.9	68.4		2.7	349.8
	4	ROW Current Account	3.8	87.2	91.4		37.0		9.2	228.6
	5	Combined Capital Account		55.4		69.4	30.3	127.3	-8.9	273.5
	6	Financial Account					126.6		0.6	127.2
	7	Errors and Omissions	-0.2	0.3	-0.3		6.6	-0.1		6.3
8			224.3	330.7	349.8	228.6	273.5	127.2	6.3	

Note: ROW signifies rest of world.

The new account (6) reflects all financial activities on capital account, such as borrowing and lending. Most, but not all, of these are carried out by banks and financial enterprises. Current activities and new physical investments of these enterprises are already included as part of the accounts of institutions. The two new entries, at the intersection of row 5 and column 6 (127.3) and the intersection of row 6 and column 5 (126.6), are identical except for the errors and omissions. In principle they must be. They express the fact that institutions incur financial liabilities to the financial sector (for example, by borrowing) and also acquire financial assets from that sector (such as currency or bank deposits). These two must balance, because a liability automatically creates a corresponding asset. They must balance in the aggregate, but, as we shall see, they need not balance for any individual subset of institutions.

We can now set out the capital account implied by the entries in row/column 5 in the familiar double entry form as follows:

<u>Incomings (row)</u>		<u>Outgoings (column)</u>	
Domestic savings	55.4	New investments (rows 2-4)	110.0
Foreign savings	69.4	Purchase of existing assets	30.3
Sale of existing assets	30.3	Acquisition of financial assets	126.6
Financial liabilities incurred	127.3	Errors and omissions	6.6
Errors and omissions	-8.9		
Total	273.5	Total	273.5

Decomposition of the Capital Account

In table 1.14 we have divided row/column 5 into three parts. The first element is labeled 5abc and includes the group of institutions identified in Sri Lanka, namely, households, enterprises (or corporations), and government; the fact that it has an "abc" at the end implies that it will be broken down still further at a later stage. The second element, labeled 5d, consists of a new category of financial enterprises, such as banks, which loom quite small in the production processes we have considered so far, but loom much larger in the financial transactions that we are considering now. They do, in fact, represent the capital and money markets through which most of the financial transactions take place. The final element in row/column 5e is the capital account of the rest of the world (ROW).

The sales of existing physical assets are now identified (5abc, 5e) mainly as sales by institutions in Botswana to the rest of the world and, to a smaller extent, vice versa. The latter transactions are explained by the interest of foreign corporations in mining enterprises in Botswana.

We see that individual accounts do not have to balance in their financial transactions. Those who save may put their savings into real or financial assets. Investors in real assets may borrow in order to finance them. This is the purpose of a capital market.

For example, we can set out the capital account of domestic institutions other than financial enterprises to illustrate this point:

<u>Incomings (row)</u>		<u>Outgoings (column)</u>	
Savings	53.9	New investment (rows 2-4)	108.6
Sale of physical assets	23.8	Purchase of existing assets	6.8
Financial liabilities incurred	90.7	Acquisition of financial assets	53.7
Errors and omissions	0.5	Errors and omissions	-0.2
Total	168.9	Total	168.9

A similar account could be made for financial enterprises (5d). It would include rather modest amounts for savings and new investment (1.5 and 1.4, respectively). The principal elements in this account would be the entries in row/column 6, that is, the sale or purchase of financial assets. In practice, these are bound to balance, except for the minor difference between savings

Table 1.14. A SAM with Disaggregated Capital Accounts for Botswana, 1974-75
(in millions of pulas)

			Expenditures										
R e c e i p t s	Current Accounts			Capital Accounts				Total					
			1	2	3	4	5abc	5d	5e	6	7	8	
	Current Accounts	1	Factors			29.2	171.4	23.0			0.7	224.3	
		2	Institutions			220.7	80.6	4.5	18.3	4.6		2.0	330.7
		3	Production			78.0	82.8	117.9	67.5		0.9	2.7	349.8
		4	ROW			3.8	87.2	91.4	36.5		0.5	9.2	228.6
	Capital Accounts	5abc	Institutions	53.9			0.3		23.5	90.7	0.5	168.9	
		5d	Financial enterprises	1.5					31.8	-9.6		23.7	
		5e	ROW	69.4			6.5		4.8	0.2		80.9	
		6	Financial Transactions				53.7		15.4	57.5	0.6		127.2
	Errors and Omissions	7	Errors and Omissions	-0.2			-0.2		6.9	-0.1	-0.1		6.3
		8	Total	224.3			330.7		349.8	228.6	168.9		127.2

Note: ROW signifies rest of world.

and new investment, but, in the table, balancing is achieved through the errors and omissions row/column. This arises, for example, because occasionally in the year-end accounts of a borrower and a lender, a liability and its corresponding asset may be valued differently (see chapter 7).

Decomposition of the Financial Transactions

The account for financial transactions (6) in table 1.14 has been broken down further in table 1.15 into four different categories: domestic currency,² bank deposits, and the like; domestic borrowing or lending; and foreign borrowing or lending. These are identified by rows/columns 6a through 6d.

As might be expected, institutions acquire additional resources (row 5abc) by incurring liabilities through domestic or foreign borrowing (columns 6c and 6d). To the extent that they do not spend these resources on physical assets (old or new), they retain them for the most part in the form of financial assets: either currency or deposits (rows 6a and 6b in column 5abc).

The account of financial enterprises (5d) in table 1.14 is of particular interest here. In presenting it in the usual form of outgoings and incomings, we make a minor modification by changing titles to "change in assets" and "change in liabilities," respectively. We could do the same for other capital accounts, but the change in this case brings out more clearly the nature of outgoings (acquisition of assets) and of incomings (incurring of liabilities). The account thus reads:

<u>Change in liabilities (row)</u>		<u>Change in assets (column)</u>	
Physical assets	1.4	Savings	1.5
Currency	0.4	Deposits received	22.9
Deposits made	0.5	Domestic borrowing	3.2
Domestic lending	14.5	Foreign borrowing	5.7
Errors and omissions	6.9	Errors and omissions	-9.6
Total	23.7	Total	23.7

Two items appear on both sides of the account: deposits and domestic lending or borrowing. There are at least two reasons for this. First, financial enterprises cover more than commercial banks. Some of them make deposits in commercial banks. These deposits appear as a liability to the banks, but an asset to the depositing enterprises. Second, financial enterprises may both borrow on the market and lend to their customers. They therefore increase their assets by lending and their liabilities by borrowing.

The account is, in fact, analogous to the change in an enterprise's balance sheet from one year to the next, except that it applies to a set of enterprises. Savings here correspond to the increase in equity investment attributable to retained earnings.

Decomposition of Institutions

In table 1.16, the final one for Botswana, institutions have been broken down into the same three constituent parts as for Sri Lanka: households, enterprises (or corporations), and central government. This has been done both for the current account (2) and the capital account (5abc).

Except for the greater amount of institutional detail, there is no change in principle from table 1.15. However, these new data now show how each set of institutions contributes to the flow of capital funds through the system. This information shows, for each of the three sets of

2. Actually, at the time there was no independent Botswana currency; the currency then circulating was the South African rand.

26 Table 1.15. Extension of the SAM for Botswana to Include Separate Accounts for Financial Assets, 1974-75
(in millions of pulas)

			Expenditures													
R e c e i p t s	Current Accounts	1	Current Accounts				Capital Accounts			Financial Accounts			Errors	Total		
			1	2	3	4	5abc	5d	5e	6a	6b	6c	6d			
		1	Factors of Production		29.2	171.4	23.0							0.7	224.3	
		2	Institutions		220.7	80.6	4.5	18.3	4.6					2.0	330.7	
		3	Production		78.0	82.8	117.9		67.5	0.9				2.7	349.8	
		4	Rest of World		3.8	87.2	91.4		36.5	0.5				9.2	228.6	
	Capital Accounts	Sabc	Institutions		53.9				0.3	23.5		38.8	51.9	.5	168.9	
		5d	Banks & financial enterprises			1.5					22.9	3.2	5.7	-9.6	23.7	
		5e	Rest of World				69.4		6.5		5.4		-0.6	.2	80.9	
	Financial Accounts	6a	Domestic Currency					5.0	0.4						5.4	
		6b	Bank deposits					22.2	0.5					.2	22.9	
		6c	Bank advances & other domestic borrowing					27.2	14.5					.3	42.0	
		6d	Foreign borrowing					-0.7	57.5					.1	56.9	
		7	Errors		-.2	.3	-.3		-.2	6.9	-.1		-.1		6.3	
		8	Total		224.3	330.7	349.8	228.6	168.9	23.7	80.9	5.4	22.9	42.0	56.9	6.3

Table 1.16. A Final SAM for Botswana, 1974-75
(in millions of pulas)

			Expenditures																	
			Current Accounts						Capital Accounts					Financial Accounts			Errors	Total		
			1	2a	2b	2c	3	4	5a	5b	5c	5d	5e	6a	6b	6c	6d	7	8	
Receips	Current Accounts	1a	Factors of Production		7.3	21.9	171.4	23.0										0.7	224.3	
		2a	Inst. Households	181.5	11.2	9.3												.7	202.7	
		2b	Enterprises	37.4	5.2	8.1	6.5	.4	5.4									.4	63.4	
		2c	Cent. Govt.	1.8	15.7	24.6		4.1	12.9	.2	3.9	0.5						.9	64.6	
		3	Production		67.2	.6	10.2	82.8	117.9	14.1	32.5	20.9	0.9					2.7	349.8	
	Capital Accounts	4	Rest of World		3.8	79.9	.3	7.0	91.4	1.4	31.3	3.8	0.5					9.2	228.6	
		5a	Households			23.1				0.1							1.7	.2	25.1	
		5b	Enterprises				11.7										35.3	41.2	1.7	89.9
		5c	Cent. Govt.					19.1		0.1	0.1		23.5				1.8	10.7	-1.4	53.9
		5d	Banks & fin. ent.					1.5									22.9	3.2	5.7	-9.6
	Financial Accounts	5c	Rest of World						69.4		6.5				5.4		-0.6	.2	80.9	
		6a	Domestic Currency							4.5	0.5	0.4							5.4	
		6b	Banks & other deposits							6.3	3.0	12.9	0.5						.2	22.9
		6c	Bank advances & other domestic borrowing							0.4	6.2	20.6	14.5						.3	42.0
		6d	Foreign borrowing							-1.7	5.7	-4.7	57.5						.1	56.9
		7	Errors		-.2	.4	-.1	-.3		-.2	.1	-.1	6.9	-.1				-.1	6.3	
		8	Total		224.3	202.7	63.4	64.6	349.8	228.6	25.1	89.9	53.9	23.7	80.9	5.4	22.9	42.0	56.9	6.3

Table 1.17. Changes in Assets and Liabilities of Households, Enterprises, and Government in Botswana, 1974-75
(in millions of pulas)

	<u>Households</u>	<u>Enterprises</u>	<u>Government</u>	<u>Total</u>
<u>Change in Assets (column)</u>				
Physical assets (new)	15.7	67.7	25.2	108.6
Physical assets (existing) a/	-	6.7	-23.7	-17.0
Financial assets	9.5	15.4	28.8	53.7
Errors and Omissions	<u>-0.2</u>	<u>0.1</u>	<u>-0.1</u>	<u>-0.2</u>
Total	25.0	89.9	30.2	145.1
<u>Change in Liabilities (row)</u>				
Savings	23.1	11.7	19.1	53.9
Financial liabilities	1.7	76.5	12.5	90.7
Errors and Omissions	<u>0.2</u>	<u>1.7</u>	<u>-1.4</u>	<u>0.5</u>
Total	25.0	89.9	30.2	145.1

a. Sales of existing assets have been brought over from the "liability" side as a negative item. This is a net figure.

institutions and for the total, the changes in assets and liabilities. In an alternative format, it can be presented as shown in table 1.17.

Households, as is often the case, saved more than they invested in physical assets and, consequently, put the difference into financial assets. Enterprises were the principal investors in physical assets and, since their savings (or equity participation) were small relatively, most of their investments had to be financed by borrowing. In this particular year (1974-75), the role of the government was unusual; it financed most of its new investment by the sale of existing assets.

THE USES OF A SAM

The effort required to put together a SAM is not trivial. Data must be ferreted out, wherever they may be available. Conflicting sources must somehow be reconciled. Rows and columns do not conveniently come to the same total in the first instance.³ What does one get out of it all except a rather complicated and impressively tidy collection of numbers?

Because social accounting matrices have not been in existence for long and there are not many of them, to say what they are useful for is partly an exercise in conjecture. Nonetheless, there seems to be sufficient foundation to make a few plausible suggestions. In the first place, a SAM is clearly a step forward in the upgrading of statistics. Recent comparisons of micro-economic information obtained from household surveys with national accounts have shown that the discrepancies between these two sources of information can be very large. How do we

3. Techniques exist for making adjustments to achieve balance at a minimum cost in terms of variation from the original; and new or improved techniques are being worked on.

choose between them? Or, should we choose between them? While construction of a SAM is certainly not going to reveal the ultimate truth, at least it forces attention on inconsistencies in a way that brings one closer to the root of their cause. Judgment, to be sure, has to be used in imposing ultimate consistency, but it can be done in such a way as to keep adjustments within plausible limits and so avoid a purely Procrustean process of fitting one set of data to the dictates of another.

The concept of a SAM goes further than the improvement of statistics for their own sake. It could be said to be the common ground of economic planners or development economists, on the one hand, and statisticians, on the other. A SAM is cast in a form that, given the fineness of detail with which it is constructed, makes the most of existing information. Economic models of an economy, which may be designed for particular purposes, nevertheless imply the existence of an underlying SAM. Parts of this implied SAM may be aggregated and parts highly disaggregated, but it is, nevertheless, a SAM. The existence of an actual SAM, against which to test the behavioral assumptions of a model and the SAM they imply, is, on the face of it, a useful way of testing the model's validity. Much has been and could be said about the relationship between models and SAMs. Examples from the growing literature are de Melo, 1979, and Dervis and Robinson, 1978. Here we shall only touch on some of the simpler applications of a SAM to the understanding of the way in which an economy works.

The uses of a SAM fall into two categories: those in which the whole corpus of information in the SAM is used and those in which only a part is used. Of course, in the latter case, it is not necessary to have the complete SAM. But the construction of the complete articulated SAM means that one has at one's disposal a multipurpose tool and does not have to construct separate subsets of accounts for each purpose. An illustration of the use of part of a SAM has been documented in the case of the Sri Lanka SAM that we have described in aggregate terms. The purpose of the exercise in question was to establish the order of magnitude of the total fiscal incentives for exporting in various sectors (see Pyatt, Roe, and associates, 1977, ch. 6). At the time (in 1970) substantial direct fiscal incentives were given to encourage nontraditional exports. At the same time, many industrial subsectors in Sri Lanka, among which, it might have been expected, would be found some potential exporters, received fairly high nominal protection. The input-output matrix within the Sri Lanka SAM was used to convert nominal protection rates into effective protection rates to these industries; in most cases, these were substantially higher than the nominal protection rates. The incentives in the tariff system that implicitly encouraged production for the domestic market could then be compared with the export incentives. In many cases, they greatly outweighed the export incentives and, in other cases, reduced them to fairly small proportions. These findings, which were unexpected, could have been reached without a SAM; its existence, however, made the task easier.

One of the principal ways in which the whole corpus of information in a SAM can be brought to bear is through multiplier analysis, which shows how changes in one or more elements of a SAM generate changes elsewhere in the matrix. Here we will only consider a simple example to illustrate the approach.

The starting point is to assume a simple economy and a highly aggregated SAM which has accounts only for the private sector, government production, the rest of the world, and a combined capital account. To keep things even simpler, it is assumed that only the private sector buys goods from the rest of the world. Corresponding to this simple economy, we assume we have a SAM for some base period, and we ask the question, "What would happen if demands on production activities were increased by increasing government expenditure (by an amount i_2), investment (by an amount i_3), and exports (by an amount i_6)?" Without loss of generality we can put the sum of the i 's equal to one.

The first part of the answer to this question is that whatever the processes of consequential changes might be, the end result will be a new SAM for our simple economy. Moreover, those

Table 1.18. Multiplier Effects in the Form of an Incremental SAM

			Expenditures					Total
			1	2	3	4	5	6
Receipients	1	Private Sector				M		M
	2	Government	Mp ₂					Mp ₂
	3	Capital Account	Mp ₃	Mp ₂ - i ₂			Mp ₅ - i ₅	i ₃
	4	Production	Mp ₄	i ₂	i ₃		i ₅	M
	5	Rest of World	Mp ₅					Mp ₅
	6	Total	M	Mp ₂	i ₃	M	Mp ₅	

Note: M(1 - p₄) = $\sum p = 1 = \Sigma i$ p₂ = marginal propensity to taxp₃ = marginal propensity to savep₄ = marginal propensity to consume (domestic)p₅ = marginal propensity to import

M = multiplier

i₂ = impulse from increased government expenditurei₃ = impulse from increased investmenti₅ = impulse from increased exports

elements of the initial SAM that are zero by definition will remain zero. Because our model assumes that only the private sector buys goods from abroad, the purchases of such goods by the government, for example, will remain zero.

Given the accounting rules and model assumptions, the difference between the new SAM and the original one will imply an incremental SAM in which many cells have zero entries. This incremental SAM is shown in table 1.18. At this stage we know the items i_2 , i_3 , and i_5 , because these are the changes that we have exogenously postulated. We also know that the blank entries in the table are zeros, because these follow from our model and accounting conventions. The question then is, "What can be said about the nonzero entries apart from i_2 , i_3 , and i_5 ?"

Not much can be said about these nonzero entries without making further assumptions about what will happen, for example, to prices, monetary policy, and how people choose to spend any extra income. We will assume, for simplicity, that private sector income goes up by an amount M , and then explore what the incremental SAM in table 1.18 can say about the relationships between M and the i 's.

Because in this simple model the private sector gets all its income from production activities and because these activities pay all value added to the private sector, row 1 and column 4 of the incremental SAM are very simple and contain zeros apart from the entry in row 1, column 4, which is M .

The increase in private income (row 1) must match the increase in private expenditures in column 1. The latter must now be spread over the different components of private expenditures. This spread is assumed to take place in the proportions p_2 , p_3 , p_4 , and p_5 , which can be referred to as the marginal expenditure propensities of the private sector. Because all the extra income M must be spent or saved, the accounting balance for row/column 1 implies that

$$p_2 + p_3 + p_4 + p_5 = 1.$$

We might also be prepared to assume that these propensities are constant. But if we do, then this is clearly a behavioral assumption, not an accounting rule.

Because Mp_2 is the only increase in income for the government, row/column 2 of table 1.18 must have sums Mp_2 . From column 2, this implies that the entry in row 3, column 2—the increase in government savings—must be $Mp_2 - i_2$.

For now, we skip over the details of accounts 3 and 4 and move to the rest of the world account (5). Here, the only increase in receipts is Mp_5 because only the private sector imports in this model. This then implies that the entry in row 3, column 5, must be $Mp_5 - i_5$. This entry measures the extent to which foreign savings, or a reduction in domestic reserves of foreign exchange, finances the increased investment, i_5 .

Returning now to account 4, the fact that row and column sums must be equal implies that

$$M = Mp_4 + i_2 + i_3 + i_5 = Mp_4 + 1,$$

or

$$M = 1/(1 - p_4).$$

In other words, the value-added M must be equal to the aggregate increases in government expenditure, investment, and exports, inflated by the factor $1/(1 - p_4)$. This factor is the familiar expenditure multiplier; it is the reciprocal of the complement of the marginal propensity to consume domestic goods. Hence, while the SAM does not tell us what value to give to M or to p_4 , it does show that once one value is fixed, the other is also fixed; and in that sense it defines the relationship between the initial increments in expenditure (the i 's) and the increase in total value added (the M).

At this stage we have discussed the balancing of four of the five accounts of the incremental SAM. That is all that is necessary, because it is always true that within a SAM the last account

will balance if all the others balance. To illustrate this point, the rule requires that, for our account 3,

$$i_3 = Mp_3 + (Mp_2 - i_2) + (Mp_5 - i_5),$$

or

$$i_2 + i_3 + i_5 = (p_2 + p_3 + p_5) M.$$

Since the sum of the i 's and the sum of the p 's are each equal to one, this can be written as:

$$1 = (1 - p_4) M.$$

Hence the condition for account 3 to balance is the same as that for account 4, that is to say:

$$M = 1/(1 - p_4).$$

This result simply repeats that obtained previously. If all but one account are balanced, then all accounts are balanced, and the story of the incremental SAM shown as table 1.18 is thus completed.

The application of multiplier analysis with a complete SAM is little different in principle, though it is far more complex. It takes into account all the interactions within each step of the process of linkages among incomes, expenditures, and production. The linkages could include, for example, the effects on other industries of expansion within a particular industry. There is, however, no longer a single multiplier, but an entire matrix of multipliers, which potentially shows the effect of expansion in one cell of the original SAM on any other cell. How these effects are to be interpreted must always be approached with care because the effect of one variable on another ultimately depends on economic behavior and not just on accounting constraints. However, the approach has some value in distinguishing accounts or subaccounts that are likely to be affected from those that are likely to be bypassed. This distinction may well have importance in considering the effect of exogenous changes on the distribution of income. The analysis may also serve to identify the important elements that result in changes in government accounts or in the balance of payments.

Several different applications of this type of analysis have been made using the Botswana SAM. In such applications the SAM relationships can trace the complex interactions inherent in the circular process. If initial changes in prices or wages are involved, the analysis can show—at least in orders of magnitude—how the initial changes affect the prices in different industrial sectors and the consumption patterns of different household groups; if interindustry relations are complex and if, as is more than likely, household consumption patterns are very different, the resulting pattern may be difficult to predict. Such analysis, however, is based in the first instance on the assumption that patterns of production and consumption are unaffected by price changes. Adaptation to take into account assumed responses can, however, be introduced. This adaptation, in fact, is essential in modeling an economy.

In a small open economy or a region, interindustry relations tend to be weak and leakages in the multiplier process large. SAMs have been constructed in each of these contexts: for example, for Swaziland and for the Muda Valley in Malaysia. (See chapter 6 for a discussion of the Swaziland SAM and Bell, Hazell, and Slade, 1982, for the Muda Valley SAM.)

The construction of accounts for a region, as opposed to a country, is likely to reveal features of the regional economy that were little appreciated before. This is obviously so because regions do not possess "national" accounts and other data normally associated with an economy as a whole. The construction of the SAM for the Muda Valley is a good illustration. In this region a large irrigation project had more or less doubled the output of rice, the main crop. Several "downstream" effects of the resultant increase in farmers' incomes are of interest. Perhaps the main one is the very large outflow of capital from the region to the rest of Malaysia. This fact

and other data in the SAM are consistent with the theory that the principal downstream effect was to increase the incomes of nonfarm households, such as traders, who were in effect "importers" from the rest of Malaysia. Leakages from the regional economy were thus substantial. It is perhaps significant that there was still a substantial number of poor landless laborers. Although the SAM may have been constructed too soon after the completion of the irrigation system to allow for opportunities for reinvestment in the region, it is, nevertheless, a clear reminder that downstream effects can simply not be taken for granted.

Clearly, no SAM can ever be constructed to answer questions except in the broadest sense. Specialists in any particular subject may have a much better idea of specific consequences, based on their accumulation of intimate knowledge, than a SAM alone could provide. But no one since Thomas Jefferson and his contemporaries can be a specialist in everything. A SAM can be used to bring out what is likely to be important in any given context and, therefore, to order the consultation of specialist knowledge to the occasion. A highly disaggregated SAM, such as that reported in Pyatt, Roe, and associates (1977) for Sri Lanka, would, of course, be physically difficult to reproduce on one sheet of paper. Even if it were possible to do so, the result would be comprehensible only to a very limited group. The great advantage of a SAM is that one can select for any occasion those parts of it to be aggregated and those parts where detail is to be preserved.

LEARNING BY DOING

There are more detailed accounts of the SAMs used in this paper, which the reader can consult. But, while further reading may give the reader a fuller taste of what a SAM is all about, there is probably no substitute for learning by doing. A do-it-yourself SAM does not have to be on the scale of the SAMs described in this paper. National accounts, balance of payments, and financial data (such as the central bank's balance sheets and consolidated statistics for commercial banks) are often readily accessible and are sufficient to start the construction of a rudimentary SAM or even a series of SAMs for different years. The data, at first, may appear inconsistent or inadequate even to this task, or other questions may crop up. But once one starts asking questions about the data, one will begin to appreciate some of the reasons it is useful to adopt a SAM framework for the numbers.

Data of this kind can often be found in the appendices of World Bank reports. The example shown in table 1.19 is taken from a report on the Yemen Arab Republic. The SAM itself is only a first cut using eight tables in the appendix for basic information and two others to make very crude estimates of the allocation of indirect taxes (line 2b) and imports (line 4) to the two production sectors (columns 3a and 3b) (World Bank, 1979; tables 2.1, 2.3, 2.4, 3.1, 3.8, 5.1, 6.1, and 6.3 were used for the basic data, and 3.4 and 3.5 were used to make the crude estimates). Anyone with access to the original data could easily improve on the SAM. The point here is to show how even a limited exercise can throw up questions of substance and consistency for further investigation.

There are forty entries in the core of the SAM and fifteen totals (each appearing twice); of these, twenty-six, including the rough estimates, could be directly entered in the core of the SAM, and ten could be entered in the totals. The rest followed easily by simple addition or subtraction, making, it is true, some arbitrary assumptions about the location of small residuals; there was one independent check on the outcome.

A special feature of the table is the row/column 1b devoted to remittances. A large part of the Yemeni labor force was working in Saudi Arabia and the Gulf states at that time. In the year in question, gross remittances (there was also some reverse flow) were equal to nearly 50 percent of factor income. The proportions were changing extremely rapidly; the corresponding

Table 1.19. A Simple SAM for the Yemen Arab Republic, 1975-76
(in millions of rials)

			Expenditures										Financial Accounts			Total			
			Current Accounts					Capital Accounts				Financial Accounts							
			1a	1b	2a	2b	3a	3b	4	5	6a	6b	7a	7b	8	9	10	11	
R e c e i p t s	Current Accounts	1a Factor Income						4220 508 100										4828	
		1b Remittances						2363										2363	
		2a Private Sector	4789 2057															6846	
		2b Public Sector	39 72 338 115															564	
		3a Production (consumption)	4900 681 293															5874	
		3b Production (capital)						814 262 94										1170	
		4 Rest of World	306 1316 547															2169	
R e c e i p t s	Capital Accounts	5 Private Sector	1874					-11 121					178					2162	
		6a Public Sector(budget)	-117										15					609 507	
		6b Public Sector (other)											9 -15 103					97	
		7a Rest of World (BOP)	-587										1288					701	
		7b Rest of World (other)											-45 181					136	
		8 Central Bank						886 258					108					1252	
		9 Commercial Banks						462 -13 3										452	
		10 Foreign Borrowing											712					712	
			Total			4828	2363	6846	564	5874	1170	2169	2162	507	97	701	136	1252 452 712	

Note: BOP signifies balance of payments.

figure in the previous year was less than 25 percent and in the following year over 75 percent. The response of the private sector to this rapid increase in resources was to save more than 25 percent (column 2a). Of these savings, less than half was invested in physical assets; the rest, plus a substantial amount of borrowing, was retained in the form of currency and deposits with commercial banks (column 5). At the same time, the government was borrowing abroad, more than enough to finance its investment. (It, too, accumulated funds in the central bank, row 8, column 6a.)

Two other features of the SAM are the consequence of the form in which the data were available. The public sector capital account has been split into budgetary and "other" transactions (rows/columns 6a and 6b). Government expenditure (investment plus consumption) in the national accounts exceeded expenditure in the budget. Similarly, official loans or grants in the balance of payments exceeded borrowing recorded in the government budget. There were evidently "government transactions" outside the budget, a large part of which must have been due to investment in public enterprises. The division is intended to draw attention to this point; there is some gratification to be had from the fact that the adjustments required to balance the line and column were trivial.

Similarly, there are two subdivisions of the rest of the world capital account. One is for the official balance of payments. Again, however, there were additional transactions, as is evident from the increase in foreign assets (row 7b) over the officially recorded reserves in the central bank (row 7a). This increase has been balanced by a corresponding inflow of capital, here allocated mainly to the private sector. One residual in the table is the intersection of row 8 and column 9. This represents an increase in deposits of the commercial banks with the central bank. Obviously, there should be little difficulty in checking this figure, but our purpose here has simply been to present what can be done with a particular set of information rather than going beyond it.

The time invested was not large, about half a day of uninterrupted time. (The compiler, moreover, had no previous familiarity with the country concerned.) Yet this was sufficient for the preparation of SAMs for six successive years. It seems a small price to pay for an articulated set of accounts which reveals, at least in order of magnitude, the salient features of the economy. It is arguable that six successive matrices of this kind give a better appreciation of change—in this case kaleidoscopic change—than do individual tables of the traditional kind. If this final example strikes a mundane note on which to finish, that may not be inappropriate. The SAM approach is a flexible tool which can be deployed with varying degrees of sophistication and for a variety of purposes, once an initial investment has been made to learn how. Although economists have long since understood that their analyses can each be set within a framework of accounts, this aspect has not usually been developed. The general point is that an economist who understands SAMs will probably be better equipped to tackle a variety of problems than one who does not.