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FOOD SECURITY IN PRACTICE

Social Accounting Matrices and Multiplier Analysis

An Introduction with Exercises

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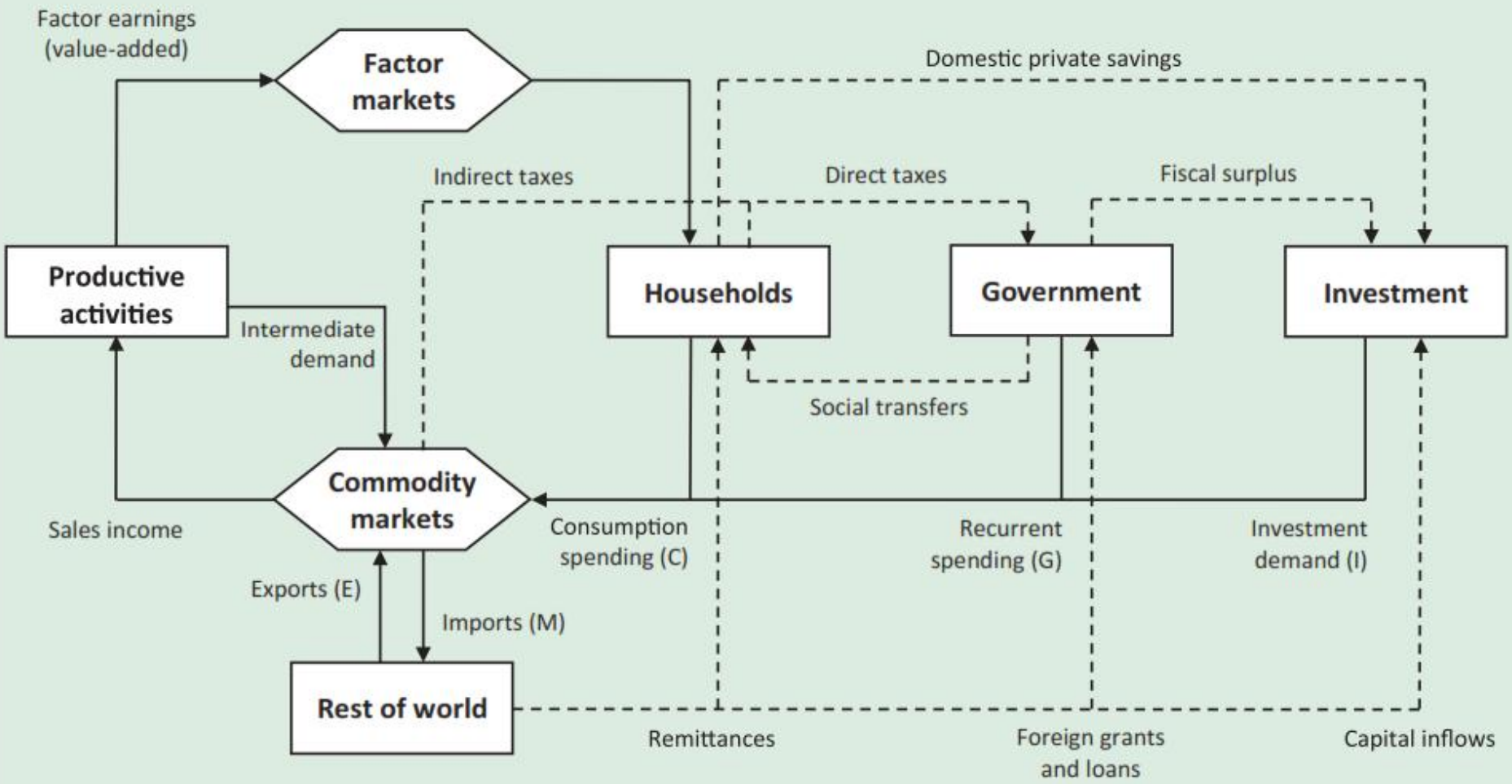
Figure 1. Circular flow diagram of the economy



WHAT IS A SAM?

One way of depicting the economy is the circular flow diagram shown in Figure 1, which captures all transfers and real transactions between sectors and institutions. Productive activities purchase land, labor, and capital inputs from the factor markets, and intermediate inputs from commodity markets, and use these to produce goods and services. These are supplemented by imports (M) and then sold through commodity markets to households (C), the government (G), investors (I), and foreigners (E). In the circular flow diagram, each institution's expenditure becomes another institution's income. For example, household and government purchases of commodities provide the incomes producers need to continue the production process. Additional inter-institutional transfers, such as taxes and savings, ensure that the circular flow of incomes is closed. In other words, all income and expenditure flows are accounted for, and there are no leakages from the system.

A SAM is also a representation of the economy. More specifically, it is an accounting framework that assigns numbers to the incomes and expenditures in the circular flow diagram. A SAM is laid out as a square matrix in which each row and column is called an "account." Table 1 shows the SAM that corresponds to the circular flow diagram in Figure 1. Each of the boxes in the diagram is an account in the SAM. Each cell in the matrix represents, by convention, a flow of funds from a column account to a row account. For example, the circular flow diagram shows private consumption spending as a flow of funds from households to commodity markets. In the SAM, it is entered in the household column and commodity row. The underlying principle of double-entry accounting requires that, for each account in the SAM, total revenue equals total expenditure. This means that an account's row and column totals must be equal.

Activities and commodities

The SAM distinguishes between "activities" and "commodities." Activities are the entities that produce goods and services, and commodities are those goods and services produced by activities. They are separated because sometimes an activity produces more than one kind of commodity (by-products). Similarly, commodities can be produced by more than one kind of activity: for example, maize can be produced by small- or large-scale farmers. The values in the activity accounts are usually measured in producer prices (that is, farm or factory gate prices).

Activities produce goods and services by combining the factors of production with intermediate inputs. This is shown in the activity column of the SAM, where activities pay factors the wages, rents, and profits they generate during the production process (that is, value-added). This is a payment from activities to factors, and so the value-added entry in the SAM appears in the activity column and the factor row [R3-C1]. Similarly, intermediate demand is a payment from activities to commodities [R2-C1]. Adding together value-added and intermediate demand gives gross output. The information on production technologies contained in the activity column is the input part of a typical "input–output table," or factor and intermediate inputs per unit of output.

Commodities are either supplied domestically [R1-C2] or imported [R7-C2]. Indirect sales taxes and import tariffs are paid on these commodities [R5-C2]. This means that the values in the commodity accounts are measured at market prices. A number of economic entities purchase commodities. As discussed, activities buy commodities to be used as intermediate inputs for production [R2-C1]. Final demand for commodities consists of household consumption spending [R2-C4], government consumption, or recurrent expenditure [R2-C5], gross capital formation or investment [R2-C6], and export demand [R2-C7]. All of these sources of demand make up the commodity row (payments by different entities for commodities). On their own, the commodity row and column accounts are sometimes referred to as a "Supply–Use Table," or the total supply of commodities and their different kinds of uses or demands.

Table 1. Basic structure of a SAM

Income rows	Expenditure columns: Activities C1	Commodities C2	Factors C3	Households C4	Government C5	Savings and investment C6	Rest of world C7	Total
Activities R1		Domestic supply						Activity income
Commodities R2	Intermediate demand			Consumption spending (C)	Recurrent spending (G)	Investment demand (I)	Export earnings (E)	Total demand
Factors R3	Value-added							Total factor income
Households R4			Factor payments to households		Social transfers		Foreign remittances	Total household income
Government R5		Sales taxes and import tariffs		Direct taxes			Foreign grants and loans	Government income
Savings and investment R6				Private savings	Fiscal surplus		Current account balance	Total savings
Rest of world R7		Import payments (M)						Foreign exchange outflow
Total	Gross output	Total supply	Total factor spending	Total household spending	Government expenditure	Total investment spending	Foreign exchange inflow	

The SAM in Table 1 shows only single activity and commodity rows and columns. However, a SAM generally contains a number of different activities and commodities. For example, activities may be divided into agriculture, industry, and services. The information needed to construct these detailed activity and commodity accounts is usually found in a country's national accounts, input–output table and/or supply–use table.[2] All of these data are usually published by a country's statistical bureau.

Savings, investment, and the foreign account

According to the ex post accounting identity, investment or gross capital formation, which includes changes in stocks or inventories, must equal total savings. So far we have accounted for private savings [R6-C4] and public savings [R6-C5]. The difference between total domestic savings and total investment demand is total capital inflows from abroad, or what is called the current account balance [R6-C7]. This is also equal to the difference between foreign exchange receipts (exports and foreign transfers received) and expenditures (imports and government transfers to foreigners). Information on the current account (or rest of world) is drawn from the balance of payments, which is usually published by a country's central bank.

Domestic institutions

A SAM is different from an input–output matrix because it not only traces the income and expenditure flows of activities and commodities, but it also contains complete information on different institutional accounts, such as households and the government. Households are usually the ultimate owners of the factors of production, and so they receive the incomes earned by factors during the production process [R4-C3].[3] They also receive transfer payments from the government [R4-C5] (for example, social security and pensions) and from the rest of the world [R4-C7] (such as remittances received from family members working abroad). Households then pay taxes directly to the government [R5-C4] and purchase commodities [R2-C4]. The remaining income is then saved (or dis-saved if expenditures exceed incomes) [R6-C4].[4] Information in household accounts is usually drawn from national accounts and household surveys from the country's statistics bureau.

The government receives transfer payments from the rest of the world [R5-C7] (such as foreign grants and development assistance). This is added to all of the different tax incomes to determine total government revenues. The government uses these revenues to pay for recurrent consumption spending [R2-C5] and transfers to households [R4-C5]. The difference between total revenues and expenditures is the fiscal surplus (or deficit, if expenditures exceed revenues) [R6-C5]. Information on the government accounts is normally drawn from public-sector budgets published by a country's ministry of finance.

Table 2. 2007 Ghana macro-SAM (millions of cedi)

		Activities C1	Commodities C2	Factors		Households C4	Government C5	Savings and investment C6	Rest of world C7	Total
				Labor C3-1	Capital C3-2					
Activities R1			24,996							24,996
Commodities R2		12,029				12,142	1,805	4,680	5,151	35,807
Factors	Labor R3-1	9,717								9,717
	Capital R3-2	3,250								3,250
Households R4				9,717	3,250		1,387		2,001	16,354
Government R5			2,372			940			739	4,052
Savings and investment R6						3,272	860		548	4,680
Rest of world R7			8,439							8,439
Total		24,996	35,807	9,717	3,250	16,354	4,052	4,680	8,439	

Value-added

[Labor, Activities: 9,717] and [Capital, Activities: 3,250]

Total value-added is the earnings received by the factors of production, such as the wages and salaries paid to labor and the profits paid to capital. Total value-added is also called "GDP at factor cost." Information on GDP for different sectors is usually found in national accounts. This was the case in Task 1, where Ghana's GDP at factor cost was reported for 14 sectors. Total value-added was split into labor and capital components using technology coefficients from Ghana's input–output table. The national capital–labor coefficient from Task 1 estimates that 75 percent of GDP is generated by labor, implying that Ghana is a "labor-intensive" economy.

Intermediate demand

[Commodities, Activities: 12,029]

Intermediate demand is the goods and services used in the production process. This was a single number in the macro-SAM in Task 1, and so it could only describe the national ratio of spending on factor to nonfactor inputs. However, a more detailed SAM that disaggregates activities and commodities would reveal differences in production technologies across sectors. For example, it would show which sectors use more fuel per value-unit of output. This information is useful when determining the effects of policies and external shocks on the economy. Information on sectors' production technologies is drawn from an input–output (IO) table. If an IO table does not exist, or if it does not include all sectors—as was the case in Ghana—then it is necessary to estimate production technologies using agricultural farm budgets and industrial surveys.

Factor income distribution

[Households, Labor: 9,717] and [Households, Capital: 3,250]

Factor incomes in the macro-SAM were paid to an aggregate household account. However, most SAMs split households into different groups, such as rural and urban. This information allows us to assess distributional impacts from policies. As a simple example, if our SAM shows that low-income households rely more on labor earnings than higher-income households, then policies that increase production in labor-intensive sectors should disproportionately benefit poorer households. Obviously, the greater the disaggregation, the more we can refine our assessment. Thus, the distribution of factor incomes is an important part of a SAM. This information is usually drawn from labor force or household income surveys. There may also be factors payments to nonhousehold accounts. For example, some of the profits earned by capital may be paid to foreign investors (for instance, mining rents) or to the government (such as state-owned enterprises). For simplicity we ignore these flows in our exercises.

Private consumption

[Commodities, Households: 12,142]

Households use most of their incomes to purchase commodities for consumption. Although the macro-SAM contains a single entry, most SAMs disaggregate private consumption across different commodities and household groups because households' consumption patterns vary, especially across income groups. For example, poorer households usually spend a larger share of their income on food than do wealthier households, and so changes in the supply of foods will affect poorer households more. These differences can influence the distributional impacts of policies and external shocks. Information on consumption patterns can be drawn from household income and expenditure surveys, such as the World Bank's Living Conditions Monitoring Surveys.

Government recurrent spending and investment demand

[Commodities, Government: 1,805] and [Commodities, Investment: 4,680]

Total absorption in an economy consists of private consumption, as well as public consumption spending and investment demand. Public consumption or recurrent expenditure consists of the goods and services purchased to maintain government function. Investment demand consists of both public and private gross capital formation, such as spending on roads, schools, and residential housing. Investment demand is therefore mainly for commodities like cement and construction services. This information is usually drawn from national accounts, government budgets, and supply-use tables.

Remittances and social transfers

[Households, Government: 1,387] and [Households, Rest of world: 2,001]

Apart from factor payments, households also receive transfers from the government and the rest of the world. Government transfers include social security payments and public pensions. Foreign receipts usually include remittances from family members living and working abroad. Conversely, households might also remit incomes to family members living abroad. In the macro-SAM, this could be reflected as a positive entry in the cell [Rest of world, Households] or, as in the Ghana SAM, as a negative addition to the cell [Households, Rest of world].

Grants, loans, and interest on foreign debt

[Government, Rest of world: 739]

Many governments in low-income countries receive grants and loans from development partners and foreign financial institutions to cover recurrent spending and capital investments. These are direct payments from the rest of the world to the government. Conversely, foreign debt requires interest payments, which are positive payments from the government to the rest of the world. Alternatively, interest payments can be treated as a negative receipt from the rest of the world. This is the convention adopted in the Ghana macro-SAM. Information on foreign grant transfers to and from the government is drawn from government budgets and the balance of payments.

Domestic and foreign savings

[Savings, Households: 3,272], [Savings, Government: 860], and [Savings, Rest of world: 548]

The difference between incomes and expenditures is savings (or dis-savings if expenditures exceed incomes). For the government account, this is equal to the fiscal surplus/deficit and for the rest of world account it is the current account balance. This information is documented in the government budget and balance of payments. However, information on domestic private savings is rarely recorded in developing datasets. Therefore, household savings is often treated as a residual when balancing a macro-SAM.

Extension of Analysis

- GDP Shares
- Gross Output Shares
- Trade Shares
- Total Demand Shares
- Macroeconomic Shares
- Household’s Income and Consumption Shares