11.481J / 1.284J / ESD.192J Analyzing and Accounting for Regional Economic Growth
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Social Accounting Matrices and Structural Analyses

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Erik Thorbecke. 1998. "Social Accounting Matrices and Social Accounting Analysis." In *Methods of Interregional and Regional Analysis*, edited by Walter Isard, Iwan J. Aziz, Matthew P. Drennan, Ronald E. Miller, Sidney Saltzman, and Erik Thorbecke. Brookfield, VT: Ashgate Publishing Company, pp. 281-331.

Why use a Social Accounting Matrix (SAM)?

- A SAM analysis supplements the input-output analysis by focusing on the income-generating mechanism for each institutional sector (i.e., households, private firms, government).

- A SAM provides information on:
  - Intersectoral linkages
  - Interregional flows within an economy
  - Income distribution by socioeconomic groups
  - The relationship of a regional economy to other local economies and to the rest of the world

What is a SAM?

- A comprehensive, disaggregated, consistent, and complete data set that describes transactions among producers, factors of production, and institutions.

- An extension of the input-output table, or just a different view

What is a SAM? (Cont'd)

Consumption Expenditure Patterns of Socio-economic Groups

Production Activities

Value Added by Sectors and Components

Institutions: Households, Companies, Government

Factor Incomes: Wages, Profits, Rents, Interests

Income Distribution by Institutions including Socio-economic Groups
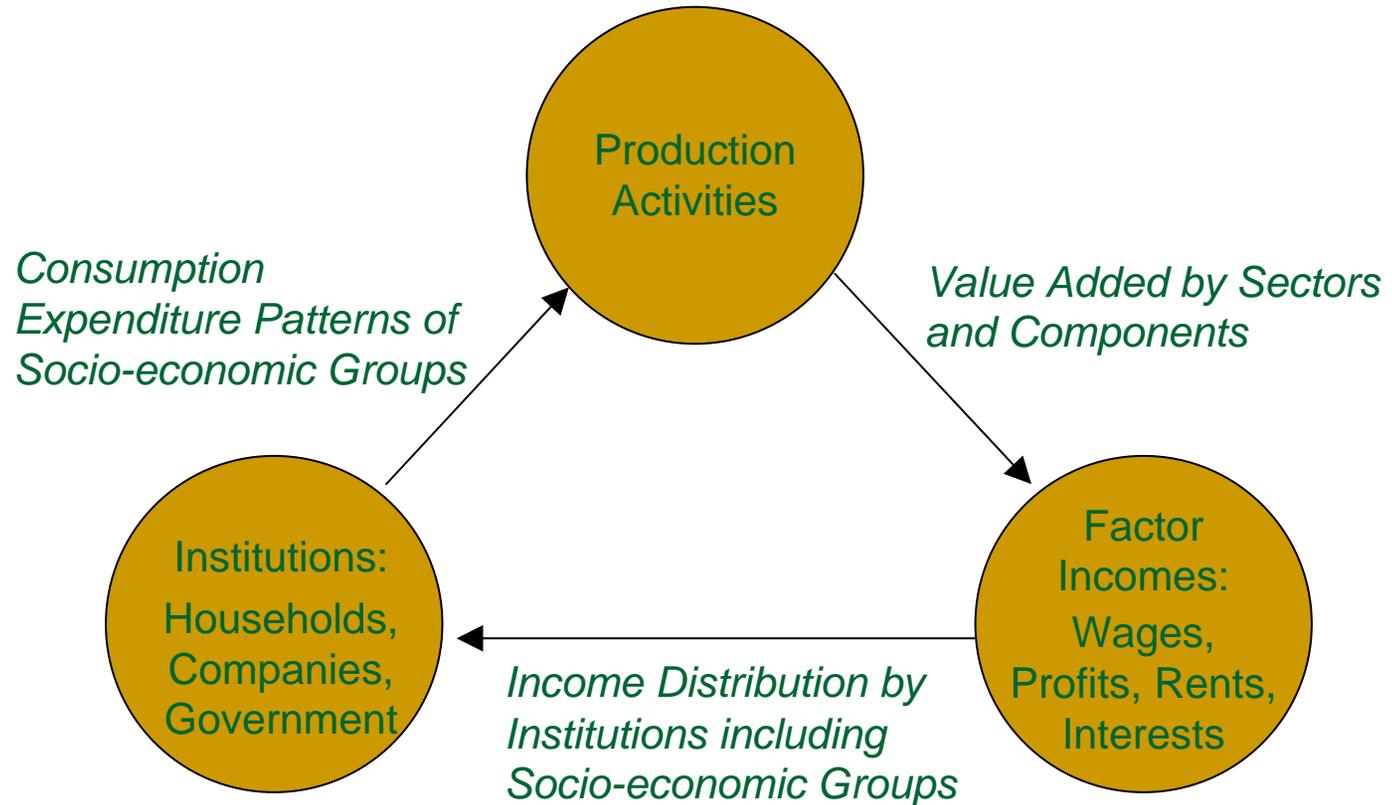
Source: Modified from Thorbecke (1998): 284.

Basic Characteristics of a SAM

- Double entry bookkeeping principle (law of conservation of energy in physics)
  - Sum of a row (receipts) = Sum of a column (expenditure)

- Entries in rows sum to same as those in columns.
  - In the input-output table, this is true only for rows and columns for the interindusty transactions.

Structure of a SAM

			Expenditures								
			Endogenous					Exogenous			Totals
			Production Activities	Factors of Produc-tion	Institutions			Capital Account	Rest of the Nation	Rest of the World	
					HHs	Firms	Govern-ment				
Receipts	Endogenous	Production Activities	T11	0	T13			F1			Y1
		Factors of Production	T21	0	0			F2			Y2
		Institutions — Households	0	T32	T33			F3			Y3
		Institutions — Firms									
		Institutions — Gov't									
	Exogenous	Capital Account	L1	L2	L3						Yx
		Rest of the Nation									
		Rest of the World									
Totals			Y1	Y2	Y3			Yx			

Social Accounting Analyses

- Multiplier analysis
  - Unconstrained multiplier
  - Constrained (mixed) multiplier

- Structural path analysis

- Computable general equilibrium (CGE) model

Social Accounting Analyses: Unconstrained Multiplier

- **Assumption of excess capacity and unused resources: Demand creates supply.**

- **Accounting multiplier matrix ($\mathbf{M}_a$)**
  - Unitary expenditure elasticities

$$\mathbf{y}_n = (\mathbf{I} - \mathbf{A}_n)^{-1}\mathbf{f} = \mathbf{M}_a\mathbf{f} \Leftrightarrow d\mathbf{y}_n = (\mathbf{I} - \mathbf{A}_n)^{-1}d\mathbf{f} = \mathbf{M}_a d\mathbf{f}$$

$$\mathbf{A}_n = \begin{bmatrix} \mathbf{A}_{11} & 0 & \mathbf{A}_{13} \\ \mathbf{A}_{21} & 0 & 0 \\ 0 & \mathbf{A}_{32} & \mathbf{A}_{33} \end{bmatrix} \qquad (\mathbf{A}_{11}: \text{I-O coefficient matrix})$$

# Social Accounting Analyses: Constrained (Mixed) Multiplier

- **Allows upper ceilings in sectoral capacity.**
  - In some sectors (e.g., agriculture), assumption of excess capacity and unused resources is unrealistic.
  - Prices are still fixed, however.

- **Strategy of Mixed SAM multipliers**
  - When excess capacity is available in a constrained sector, we can use a fixed price multiplier ($\mathbf{M}_c$).
  - If the capacity is used up, however, a mixed multiplier ($\mathbf{M}_m$) can be used for the remaining demand, instead of $\mathbf{M}_c$.
 - Thus, the final multiplier matrix would be $\mathbf{M}_c + \mathbf{M}_m$.

Social Accounting Analyses: Structural Path Analysis

- Examines different ways an exogenous change affects a target group.

- Three types of influences:

$$i \xrightarrow{c_{xi}} x \xrightarrow{c_{yx}} y \xrightarrow{c_{jy}} j$$
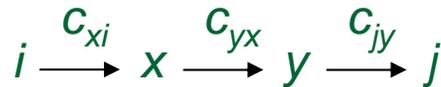
Direct influence = $c_{xi}\, c_{yx} c_{jy}$

$$i \xrightarrow{c_{xi}} x \xrightarrow{c_{yx}} y \xrightarrow{c_{zy}} j$$

with c_{xz}, c_{xy}, c_{zy} through z
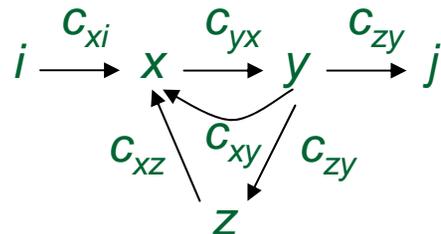
Total influence = $c_{xi}\, c_{yx} c_{zy}[1 - c_{yx}(c_{xy} + c_{zy}c_{xz})]^{-1}$

$$i \xrightarrow{c_{xi}} x \xrightarrow{c_{yx}} y \xrightarrow{c_{zy}} j$$

with c_{xz}, c_{xy}, c_{zy} through z and v
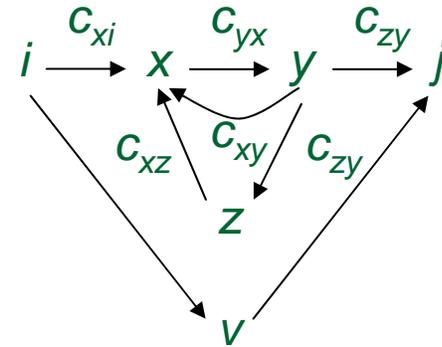
Global influence = Sum of relevant total influences

Social Accounting Analyses: Computable General Equilibrium (CGE) Model

- A CGE model takes information from a base-year SAM for its initial conditions.

- But it includes a number of behavioral and structural relationships to describe the behavior of the various actors over time: e.g., utility maximization for households, profit maximization for firms

- In a CGE model, most prices are endogenously determined.

- CGE framework is suitable for long time-series analyses.

Synthesis and Conclusion

- A SAM complements missing dimensions of the input-output framework.
  - Socio-economic analyses are feasible with a SAM.
  - Entries for a SAM can be simplified and specified by research purpose.

- However, a SAM needs considerable time and thought for its construction.
  - Data for SAM come from various sources.
  - Supplementary surveys are often necessary.

Synthesis and Conclusion

- Some SAM-based approaches still have the same weaknesses that the input-output model has.
  - E.g., SAM multipliers and structural analysis
  - Demand-oriented; fixed prices; constant returns to scale; fixed input coefficients; no joint production of goods among sectors
  - Not suitable for long-term simulation

- CGE model, which also uses a SAM as major data sources, can resolve some of those problems.
  - Prices and input coefficients are endogenously determined.
  - More realistic predictions for the future
  - But this model also needs various assumptions.