



Input-Output Analysis

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Session 1.1

Introduction to Input-Output Framework

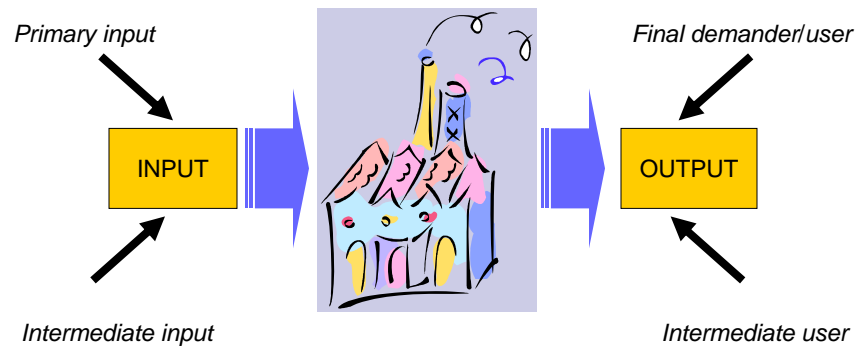
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Basic concepts

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Production process

Production process transforms inputs into outputs



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Intermediate input transaction

- There are flows/movements of intermediate inputs across sectors. E.g., from sector i to sector j .
 - Intrasector possible, i.e., from sector i to i itself
- X_i is total output sector i ,
 z_{ij} is monetary value of goods flow
--or, transaction value-- from sector i to sector j
 Y_i is total final demand of sector i .

If there are n sectors in the economy, one could write:

$$X_i = z_{i1} + z_{i2} + z_{i3} + \dots + z_{in} + Y_i$$

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For the economy as a whole

- There are n -equations like the above.
- All of them is a system of equation pertaining the whole economy, written as follows:

$$\begin{cases} X_1 = z_{11} + z_{12} + z_{13} + \dots + z_{1n} + Y_1 \\ X_2 = z_{21} + z_{22} + z_{23} + \dots + z_{2n} + Y_2 \\ \vdots \\ X_n = z_{n1} + z_{n2} + z_{n3} + \dots + z_{nn} + Y_n. \end{cases}$$

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Row vs. column

- In terms of row, one sees the distribution of output across sectors:
To intermediate sectors and final users

$$\begin{cases} X_1 = z_{11} + z_{12} + z_{13} + \dots + z_{1n} + Y_1 \\ X_2 = z_{21} + z_{22} + z_{23} + \dots + z_{2n} + Y_2 \\ \vdots \\ X_n = z_{n1} + z_{n2} + z_{n3} + \dots + z_{nn} + Y_n. \end{cases}$$

- In terms of column, one observes the input composition of a particular sector:
From intermediate inputs and primary inputs

$$\begin{bmatrix} z_{11} \\ z_{21} \\ z_{31} \\ \vdots \\ z_{n1} \end{bmatrix}$$

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In a complete table – a typical IO table

		Production Sector		Final Demand				Total Output
		1	2	C	I	G	E	X
Production Sector	1	z_{11}	z_{12}	C_1	I_1	G_1	E_1	X_1
	2	z_{21}	z_{22}	C_2	I_2	G_2	E_2	X_2
Value Added	L	L_1	L_2					L
	N	N_1	N_2					N
Import	M	M_1	M_2					M
Total Input	X	X_1	X_2	C	I	G	E	X

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Three basic matrices

$$Y = \begin{bmatrix} Y_1 \\ Y_2 \end{bmatrix} = \begin{bmatrix} C_1 + G_1 + I_1 + E_1 \\ C_2 + G_2 + I_2 + E_2 \end{bmatrix}$$

	Production Sector		Final Demand				Total Output
	1	2	C	I	G	E	X
Production Sector	1	2	C_1	I_1	G_1	E_1	X_1
	2		C_2	I_2	G_2	E_2	X_2
Value Added	L						L
	N						N
Import	M						M
Total Input	X		C	I	G	E	X

$$Z = \begin{bmatrix} Z_{11} & Z_{12} \\ Z_{21} & Z_{22} \end{bmatrix}$$

$$W = \begin{bmatrix} L_1 & L_2 \\ N_1 & N_2 \end{bmatrix}$$

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Macroeconomics of IO table

- We must be able to verify the three methods of calculating Gross National Product from the IO table

- Expenditure approach $X_1 + X_2 + L + N + M = X$
 $= X_1 + X_2 + C + I + G + E$

$$L + N = C + I + G + E - M.$$

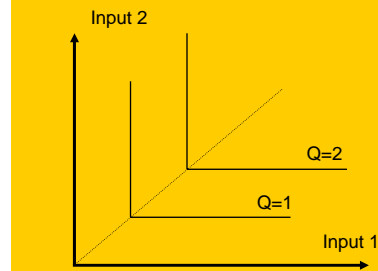
- Production approach: summation of value added
- Income approach: income is factors payment which is identical to value added

$$\begin{aligned} Q &= VA_1 + VA_2 \\ Q &= (L_1 + N_1) + (L_2 + N_2) \\ &= (L_1 + L_2) + (N_1 + N_2) = L + N \end{aligned}$$

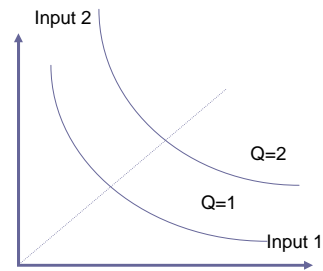
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Microeconomics on production function

Leontief Production Fct.



Fixed proportion
Constant return to scale



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Features of input-output production

- Fixed proportion
Fixed ingredients – only one way producing the output optimally
- Constant return to scale
Doubling the inputs will exactly double the output

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Next question

- What kind of analysis can we apply to the table?