

MULTIPLIERS AND LINKAGES

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REGIONAL SOCIOECONOMIC IMPACT ANALYSES AND MODELING

CURRENT MAJOR CONCEPTUAL ACCOUNTING FRAMEWORKS

- System of National Accounts (SNA)
- European System of National Accounts (ESA)
- U.S. System of National Accounts
- Material-Product System (MPS)

INDUSTRIAL CLASSIFICATIONS

Standard Industrial Classification (SIC) codes: Used in the United States until 2000.

International Standard Industrial Classification (ISIC) codes. Used by Europe and most countries outside of North America.

North American Industrial Classification System (NAICS). Used in the United States starting in 2000.
“ . . . developed jointly by the U.S., Canada, and Mexico to provide new comparability in statistics about business activity across North America.”

SAMPLE NAICS CODES FOR MINING

| | |
|--------|--|
| 21 | Mining |
| 212 | Mining (except Oil and Gas) |
| 2123 | Nonmetallic Mineral Mining and Quarrying |
| 21232 | Sand, Gravel, Clay, and Ceramic and Refractory Minerals Mining and Quarrying |
| 212321 | Construction Sand and Gravel Mining |
| 212322 | Industrial Sand Mining |
| 212324 | Kaolin and Ball Clay Mining |
| 212325 | Clay and Ceramic and Refractory Minerals Mining |

DETERMINING BASIC AND NONBASIC SECTORS

- ASSUMPTION METHOD
- SURVEY METHOD
- LOCATION-QUOTIENT METHOD
- MINIMUM-REQUIREMENTS METHOD

LOCATION-QUOTIENT (LQ) METHOD

If $LQ > 1.0$ region exports

If $LQ = 0.0$ region neither exports nor imports

Selected problems

- a. Some local industries (e.g., hotels) and federal and state government output depend largely on nonlocal industries, therefore, they are really a basic sector.
- b. Local government is basic regardless of LQ.
- c. Look carefully at real estate and construction activities that may be tied to a booming national economy or heavy immigration.
- d. What are others?

U.S. DATA SOURCES

- Employment data:
 - County Business Patterns*--U.S. Bureau of Census--2-digit, 3-digit, 4-digit
 - County, state, and national--BLS employment and wages program--ES-202--*Employment and Wages Reports* 2-digit, 3-digit, 4-digit. Covers 98% hourly civilian labor, 40% agricultural labor, 90% State and Local Government (SLG) labor.
- Output data: Census information for value of shipments
- Income data: Diverse sources.

ECONOMIC-BASE MULTIPLIER

Assumptions

1. Regional growth in income is a function of outflows from the base sector.
2. Growth in service (nonbasic) sector is directly dependent on growth in basic sector.
3. Relationship between the growth in the two sectors is stable.

DETERMINATION OF BASIC AND NONBASIC SECTORS I

Model

$$y^g = (s^g - m^g) + o^g \quad (1)$$

where

y^g = total income in region g,

s^g = local spending in region g,

m^g = inflows into region g, and

o^g = outflows from region g.

$$s^g = s^g y^g \quad (2)$$

$$m^g = m^g y^g \quad (3)$$

DETERMINATION OF BASIC AND NONBASIC SECTORS II

Model

$$O^g = O^{-g} \quad (4)$$

$$y^g = s^g y^g - m^g y^g + O^{-g} \quad (5)$$

$$y^g = O^g / (1 - s^g + m^g) \quad (6)$$

$$K = dy^k / dO^g = 1 / (1 - s^g + m^g) = y^g / O^{-g} \quad (7)$$

INPUT-OUTPUT MULTIPLIERS

$$X = AX + Y$$

$$X - AX = Y$$

$$IX - AX = Y$$

$$(I - A)X = Y$$

$$(I - A)X / (I - A) = Y / (I - A)$$

Divide both sides by (I-A), thus enabling you to cancel the (I-A) on the left-hand side.

$$X = (I - A)^{-1} Y$$

Where X = total output of n sectors.

A = matrix of technology input coefficients.

Y = vector of final demand

I = identity matrix, with 1s along the main diagonal and zeros elsewhere.

INPUT-OUTPUT MULTIPLIERS (CONT'D)

$(I - A)^{-1}$ is the input-output multiplier, which I will refer to as D . It is an output multiplier.

We can convert it into an employment (or income or value added) multiplier. Refer to notes from MIT class 11.481J, spring 2005.

INPUT-OUTPUT CALCULATIONS

- TYPES OF MODELS
 - Static
 - Dynamic
 - Open
 - Partially closed with respect to households
- TYPES OF COEFFICIENTS
 - Direct input $X_{ij}/X_j = a_{ij}$
 - Direct and indirect input (Leontief inverse)
 - Direct, indirect, and induced input