Tools for Regional Economic Development: Input-Output Models

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Overview

• Introduction to input-output models
• IMPLAN input-output model
• Economic impact analysis
• Some examples
Input-Output Models

• Input-output models measure inter-industry linkages
• Allow for the evaluation of changes in one industry sector on other sectors
• Produce a multiplier that measures the total effect of an increase (or decrease) in demand on employment or income

Source: Stimson, Stough, and Roberts, 2006, p. 157
Input-Output Models

• Based on a set of accounts describing transactions among major economic sectors
  – Intermediate: private business activities
  – Households: individuals/families residing or employed in the region
    • Both buyers of goods & services and sellers of labor
  – Government: local, state, and national
  – Outside world: activities located outside the region
  – Capital: stock of private capital

Source: Stimson, Stough, and Roberts, 2006, p. 158
Input-Output Models

Source: Hoover, 1971, p. 227
<table>
<thead>
<tr>
<th>Intermediate sector, by industry</th>
<th>Households (consumer goods sales in region)</th>
<th>Government (sales to governments)</th>
<th>Outside (exports)</th>
<th>Capital (gross private investment, including additions to inventories)</th>
<th>Output totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>300</td>
<td>1600</td>
<td>500</td>
<td>200</td>
<td>700</td>
</tr>
<tr>
<td>B</td>
<td>50</td>
<td>100</td>
<td>200</td>
<td>100</td>
<td>900</td>
</tr>
<tr>
<td>C</td>
<td>1000</td>
<td>100</td>
<td>300</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>700</td>
<td>0</td>
<td>0</td>
<td>400</td>
</tr>
<tr>
<td>Output totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Primary supply sectors          |                                           |                                   |                  |                                                               |              |
| Households (labor services)     | 1900                                      |                                   |                  |                                                               |              |
| Government (public services)    | 200                                       | 100                               | 200              | 100                                                           |              |
| Outside (imports)               | 200                                       | 300                               | 300              | 0                                                             |              |
| Capital (capital consumption and withdrawals from inventories) | 650                                       | 550                               | 200              | 100                                                           |              |
| INPUT TOTALS                    | 4300                                      | 2850                              | 3100             | 2600                                                          |              |

Source: Hoover, 1971, p. 226
## Input-Output Models

<table>
<thead>
<tr>
<th>Purchases (in dollars) from:</th>
<th>Per dollar's worth of gross output in:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td><strong>Intermediate sector</strong></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>.070</td>
</tr>
<tr>
<td>B</td>
<td>.012</td>
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<tr>
<td>C</td>
<td>.233</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
</tr>
<tr>
<td><strong>Primary supply sectors</strong></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>.442</td>
</tr>
<tr>
<td>Government</td>
<td>.047</td>
</tr>
<tr>
<td>Outside</td>
<td>.047</td>
</tr>
<tr>
<td>Capital</td>
<td>.151</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>1.000</td>
</tr>
</tbody>
</table>

* Columns do not always add exactly to totals, because of rounding off.

Source: Hoover, 1971, p. 226
Impact Analysis

• Impact analysis attempts to determine the effects of a change on specific socioeconomic groups, business sectors, or locations, and/or its effects over time

• Types of impacts
  – Physical
  – Demographic
  – Social
  – Fiscal
  – Economic
Impact Analysis

- Factors to consider
  - Location of impacts
  - Monetary or nonmonetary
  - Primary and secondary
  - Private and public
  - Positive and negative
Impact Analysis

• Location of impacts
  – Physical borders
  – Political borders
  – Economic conditions
    • Urban vs. rural
    • Proximity of likely employees and suppliers

Impact analysis factors to consider
• Location of impacts
• Monetary or nonmonetary
• Primary and secondary
• Private and public
• Positive and negative
Impact Analysis

- Location
Impact Analysis

• Location
Impact Analysis

• Location
Economic Impact Analysis

• Primary or Direct effects
• Multiplier effects
  – Indirect
  – Induced
• Present value of future impacts
• Costs?

• Impact analysis factors to consider
  – Location of impacts
  – Monetary or nonmonetary
  – Primary and secondary
  – Private and public
  – Positive and negative
Primary Impacts

- What is a primary impact?
- Impact location
- Local expenditures vs. imports
- Time frame
- Dollar amount of impact
Primary Impacts

Producer value at Factory = $250

+ Transportation Margin = $30

+ Wholesaler Margin = $100

+ Transportation Margin = $30

+ Retailer Margin = $190

Purchaser Price = $600
Primary Impacts

• Export Base Theory
  – Basic + Non-Basic = Total Activity
  – Total Activity = f(Basic) = Basic x multiplier

• The economy is driven by “Basic” activity. Basic activity is that which brings in money from outside the region, or keeps money in the region that would otherwise leave.
Secondary Impacts

• The Multiplier Effect
  – Indirect impacts
    • Increased activity due to firms buying their inputs from other firms within the study area.
  – Induced impacts
    • Increased activity due to firm’s employees spending their income in the study area.
Input-Output Models

Source: IMPLAN
# IMPLAN Input-Output Model

<table>
<thead>
<tr>
<th>INDUSTRIES</th>
<th>COMMODITIES</th>
<th>FACTORS</th>
<th>HOUSEHOLDS</th>
<th>GOVERNMENTS</th>
<th>CAPITAL</th>
<th>TRADE</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industries</td>
<td>MAKE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EXPORTS</td>
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<tr>
<td>Commodities</td>
<td>USE</td>
<td>CONSUMPTION</td>
<td>CONSUMPTION</td>
<td>INVESTMENT</td>
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<td></td>
<td>Commodity Output</td>
</tr>
<tr>
<td>Factors</td>
<td>VALUE ADDED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Factor Receipts</td>
</tr>
<tr>
<td>Households</td>
<td>Sales</td>
<td>DISBURSEMENTS</td>
<td>TRANSFERS</td>
<td>TRANSFERS</td>
<td>TRANSFERS</td>
<td>EXTERNAL INCOME</td>
<td>Household Receipts</td>
</tr>
<tr>
<td>Governments</td>
<td>Sales</td>
<td>DISBURSEMENTS</td>
<td>TAXES &amp; TRANSFERS</td>
<td>TRANSFERS</td>
<td>TRANSFERS</td>
<td>EXTERNAL SERVICES</td>
<td>Government Receipts</td>
</tr>
<tr>
<td>Capital</td>
<td>Sales</td>
<td>DISBURSEMENTS</td>
<td>TAXES &amp; TRANSFERS</td>
<td>TRANSFERS</td>
<td>TRANSFERS</td>
<td>NET INVESTMENT</td>
<td>Capital Receipts</td>
</tr>
<tr>
<td>Trade</td>
<td>IMPORTS</td>
<td>IMPORTS</td>
<td>IMPORTS</td>
<td>IMPORTS</td>
<td>TRANS-</td>
<td>IMPORTS</td>
<td>Trade Receipts</td>
</tr>
<tr>
<td>TOTALS</td>
<td>Industry Outlay</td>
<td>Commodity Outlay</td>
<td>Factor Outlay</td>
<td>Household Outlay</td>
<td>Government Outlay</td>
<td>Capital Outlays</td>
<td>Trade Outlays</td>
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<tr>
<td>Employment</td>
<td>JOBS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: IMPLAN
Input-Output Model

• Multipliers
  – Output multipliers - based on inter-industry transactions
  – Income, employment and value added multipliers are based on output multipliers
Input-Output Analysis

• Multipliers

  – Includes the direct or primary spending
  
  – Includes *indirect* spending, or businesses buying and selling with each other
  
  – Plus household spending based on the income earned from the direct and indirect effects - the *induced* effect
  
  – Multiplier = Primary + Indirect + Induced

          ____________
          Primary

          "Multipliers" includes the direct or primary spending, indirect spending, or businesses buying and selling with each other, plus household spending based on the income earned from the direct and indirect effects - the *induced* effect. The multiplier is calculated as the sum of primary, indirect, and induced spending divided by the primary spending.
Input-Output Analysis

• Multiplier rules of thumb
  – At the local level, employment multipliers of greater than 3 are extremely rare
    • Manufacturing 1.8 to 2.5
    • Non-manufacturing 1.3 to 1.8
    • Service/retail 0 to 0.8
Input-Output Analysis

• Some examples using IMPLAN
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