11.482J / 1.825J / ESD.193J Regional Socioeconomic Impact Analyses and Modeling
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Seminar: Analysis Tools to Assess Economic Impacts and Opportunities

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Topics

1. *Input-Output* Models
2. *Simulation* Models
3. *Competitive Market* Analysis
5. Matching Models to Analysis Scenarios
(1) INPUT-OUTPUT MODELS

- Inter-Industry Technology Matrix, Buy and Sell Matrices

- Regional Purchase Coefficients based on Location Quotients (Ratio of Local to National Industry Intensity), adjusted for cross-purchasing

- Assumes that future gains/losses of output or demand will affect suppliers and worker income re-spending in proportion to current patterns
Input-Output Multiplier Models

- BEA (US), RIMS, IMPLAN, survey-based local studies
- Trace Inter-Industry Buying & Selling impacts of exogenous growth or decline in given industries
- Reflect Current Technologies and Local Purchasing

Can be used to Assess:

- Current Economic Role (Contribution) of an Existing Industry, Facility or Program
- Expected Impact of a Change in Output (Business Opening, Closing, Expansion, Contraction)
- Expected Impact of a Change in Spending and Sources for Purchases
Spending Case Study
*(requires I-O Model)*

Economic Impact of the Boston Harbor Project
Regional Purchases

Percent Supplied Locally

- Metal Prod
- Construct
- Petroleum
- Retail
- Service
- Business
Impact Flowchart

Total
- Construction
  Spending $2.9b

Region
- Total Demand $4.2b
  (Direct + Indirect + Induced)
  - $1.6b

Outside
- $1.3b
- $1.1b

Total Metro Benefit over 10 years:
- 4,000 - 9,000 jobs/yr (total 41,000 person-yrs)
- $300m - $700m sales/yr (total $3.1b sales)
- $200m - $400m income/yr (total $1.9b income)
Breakdown of Impacts
requires IMPLAN type model

Total Jobs (Average Year)

- Construct-1515
- Service-1306
- Retail-418
- Wholesale-208
- Trans+Util-133
- Finan/Ins - 183
- Manuf-61
- Govt-307
- Other-21
Limitation of I-O Models

- Not dynamic – no time dimension for response
- No effect of crowding out, excess demand to constrain large growth
- No cost responsiveness
- Assumes fixed Location Quotients (local shares)
(2) ECON SIMULATION MODELS

• Include I-O Matrices and Regional Purchase Coefficients as given

• Add Year-by-Year forecasting

• Add Labor, Housing Price / cost responses

• Add Migration Responses

• Allows for future effects on suppliers and worker income to shift with changes in supply and demand for labor and capital
Regional Simulation Models

• REMI, REDYN, INFORUM, FAIR, REAL MODEL
• Forecast Base Case vs. Future Scenario: *price/cost mechanism as “Feedback Loops” to mitigate impacts*
• Reflect Current Technologies and Local Purchasing

Can be used to Assess:

• Response to Proposed Changes in Taxes, Prices or Local Costs
• Response to Changes in Business Output (Opening, Closing, Growth) or Spending *esp. when effects are large enough to shift labor or material prices.*
Energy Case Study
(requires regional simulation model)

Economic Impact of Iowa Energy Policies
Electricity % of Total Production Cost

% Growth

Primary Metals
Chemicals
Paper
Textiles
Elec Equip
Food Proc
Sensitivity to Electric Cost Change

(Graph of Response to 20% Electric Cost Savings)

% Growth

Primary Metals  Chemicals  Paper  Textiles  Elec Equip  Food Proc
Direct Econ Effect: Renewable Power

Added Plant Cost (per 100kW)

Change in Annual Cost (1B kWh)
Regional Purchase Coefficients

![Bar chart showing regional purchase coefficients for Coal, Biomass, and Wind.](chart.png)
REMI Model Forecast:
1% of Iowa Electricity from Renewables

Disposable Income Change ($M, Statewide)
Value of a Simulation Model: Price Effects
(REMI -- Handling of Jobs vs. Income)

Example of Program to Maximize Jobs ... 

-Just Ban Excavating Equipment and give Everyone a Shovel!

... Actual Result is a Overall Loss of Income !!!
Limitation of Simulation Model

- Linear – no thresholds – prices respond proportionately to demand changes
- Assumes generally fixed Location Quotients (local shares)
- Economic geography (if any) scaled by distance
- No recognition of international trade, supply chain connectivity
- No recognition of education, infrastructure, other quality features among market competitors
(3) COMPETITIVE MARKET ANALYSIS

Surveys & Statistics: Stated & Revealed Preferences
(1) Assess Demand for Product/Service
(2) Assess Supply of Competitors & Strength/Weakness
(3) Estimate Market Capture for New Product/Service

Can be used to Assess:
• Development Feasibility
• Product/Service Use Level
• Customer Characteristics (Local vs. Non-Local)

Needed to Build Exogenous Inputs to Econ (I-O and Simulation) Models
Conventional/Visitor Case Study
(requires market study plus I-O or Simulation)

Economic Impact of Portland, Maine Convention Center
Market Study: Amount of Convention Visitors & Spending Pattern

NET

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<th>City</th>
<th>County</th>
<th>State</th>
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<td><strong>Hotels</strong></td>
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Millions of Dollars/Yr

0   5   10   15   20   25   30
I-O Tables: Operations Impact

Total Convention Center Spending $24m/yr

Region

Total Demand $33m (Direct + Indirect + Induced)

Outside

Total County Benefit over 20 years:
- 450 jobs/yr (total 9,000 person-years)
- $18m sales/yr (total $360m sales)
- $10m income/yr (total $200m)
Overall Financial Feasibility
(requires Fiscal Model)

Occupancy
Tax Rate

Year

Rev 1.5% Tax
Annual Cost
Rev 1.0% Tax
(4) ECON OPPORTUNITY MODEL

- Assumption: “The role of economic developers is to make traditional economic models wrong” - G. Weisbrod

- Use “Benchmarking” to neighbors / competitors instead of comparing to national averages

- Use LQ to identify gaps in potential mix rather than current import/export roles

- Assess strengths and weaknesses relating to Quality, Scale and Connections (rel to competitors) rather than only Prices / Costs rel to US as in econ simulation models.
Economic Opportunity Model

• Rate availability and quality of factors that are *Not Covered* by regional economic models
• Identify how they affect economic development opportunities

Can be used to:
• Target opportunities for additional economic growth
• Tailor projects and programs to address current deficiencies holding back further economic growth
• Assess risk / uncertainty associated with future project/program scenarios
LEAP
Local Economic Assessment Package

Factors Affecting Business Attraction Competitiveness but missing in I-O or Simulation models:

- Accessibility to Airport
- Type of Air Service
- Access to Marine Port
- Access to Rail Freight
- Access to Interstate Hwy
- Labor Market Size
- Labor Market Education
- Delivery Area Market
- Broadband Penetration

- Tourism / Visitor Attraction
- International Export Base
- Business Cluster Integration
- Housing and Utility Costs
- Industrial Parks (features) *
- Office Facilities (features) *
- Downtown Image *
- Business Support Programs*

* = site assessment worksheet rating
Combining LQ and SS in Comparison to Competitors

- Local industry is strong in mix and growth trend
- Local industry is strong, could have potential for more growth
- Local industry is underperforming; opportunity for growth
- New emerging local industry; candidate for nurturing
- Weak local sector, but some opportunity for growth
- Industry is threatened locally, candidate for attention
- Industry is in national decline, candidate for diversification
- Unstable national industry; opportunity for growth but some risk
- Weak local sector in national decline
Other factors to consider:

Growth & Gap Remaining

Additional Growth & Gap

Diagnose Competitiveness

Elements not in I-O Models

Comparison of Factors
Bundles of Tools in LEAP

(1) Economic Base Assessment – evaluation tool to rate current economic performance and trends

(2) Targeting Diagnostics – diagnostic tool to target prospective industries for further growth & attraction

(3) Policy Analysis – analysis tool to assess consequences of future scenarios & public actions
Uses of Econ Opportunity Models

Areas seeking to:

- Diversify their economic base
- Become more attractive to growth industries
- Expand job quality & pay level
- Reduce dependence on stagnant or declining industries
- Improve business stability by enhancing supporting & complementary activities
ADE-2
Airport Development Economics Model

Factors Affecting Airport Business Attraction:

Airport Activity
- Passenger & Freight Mix
- Flight Routes

Regional Economy
- Population Size
- Employment/Industry Mix
- Specialization: Tourism, Education, Research, Financial, etc.

Airport Function
- Commuter, Hub, Gateway, Maintenance

Airport Area Setting
- Land Available
- Land Use Pattern
- Access to City Center
- Office Parks Areas
- Other Area Specialization
Lessons

Don’t Ignore the nature (adequacy and quality) of local facilities & services in addition to cost factors -- they can dramatically affect opportunities and impacts.

Set up the right order for analysis. First decide on the *Policy Issue*. Then apply appropriate analysis tools to fit the policy issue (not the reverse).