Regional Economic Development Impacts of Transportation Investments

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Contents of this Presentation

- Background
- ED Impacts – What units are used to measure them?
- ED Impacts – How does it happen (Impact Mechanisms)
- ED Impact Assessment – The Steps
- A Review of Some Past Studies
Background
Role of Transportation Infrastructure

- Transportation systems: backbone of an economy
- Transportation closely related to economic output
  - Good transportation system essential for
    - getting goods to market (customers)
    - workers to/from businesses, etc.

Source: US Department of Transportation, Bureau of Transportation Statistics, 1999 National Transportation Statistics
National VMT/GDP Trends (1960-1998)

Source: US Department of Transportation, Bureau of Transportation Statistics, 1999 National Transportation Statistics
ED Impact Assessment – Why the Emphasis on Highways?

Freight transportation increasingly dominated by the highway mode

Modal share of highways in freight trsp. (%)
Transportation/Economy: A Symbiotic Relationship
- Every $1 billion invested in transportation infrastructure generates > $2 billion in economic activity and creates up to 42,000 American jobs.

- The transportation construction industry:
  - generates $200 billion in annual economic activity
  - sustains > 2.2 million American jobs.

- 11.3 million Americans (approx. 10% of working population) have transportation-related jobs.

Highway construction alone directly generates 8 jobs per $1 million spent (1996$) on construction

Public Transportation directly supports an average of 24.5 jobs per million passenger-miles
(Source: “APTA Report,”).

Airports support an average of 75 to 1,000 on-site jobs per 100,000 annual passengers
(Source: studies at selected airports).
Transportation

The Economy

- Increased number or size of: Factories, Schools, Service Companies, etc.
  - Increased need for movement of people, goods, services
  - Increased travel
  - Higher need for physical transportation facilities

- This need is felt by private sector

- Statement of Need is formalized by transportation planner, city planners, legislators, general public, etc.

- Decision to fulfill the need is legislated by - public sector (federal/state/local government)

- Funding for the transportation facility provided by public sector, private sector, or both.
So, Why Assess ED Impacts of our Transpo Projects?

- **Project planning/program development:**
  - Forecasting future impacts of proposed projects
    - Identify cost-effective projects.
    - Efficient allocation of funds
    - Decision-making to select the best project
    - Justify the value of transportation investment.

- Investigate if a completed project has achieved its goals

- Public information.

- **Fulfilling federal requirements (NEPA, TEA-21).**
ED Impacts – What Units are Used to Measure?

- Jobs
- Income
- Business Sales
- Productivity
- Property values
- Quality of life
ED Impact Mechanisms

Transp. Impacts on Impacts ED : How does it happen?

- Link key centers in region to national markets
- Provide for more efficient flows of commerce
- Provide access to new services and employment opportunities
- Provide local access roads to stimulate retail development
- Open up new sites for commercial/industrial development
- Support new business initiatives
- Promote tourism/recreational development
- Provide quality of life benefits
ED Impact Mechanisms

Economic Development Impacts: How do they happen?

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Can we categorize these mechanisms?
Categories of ED Impact Mechanisms

- Direct mechanisms
- Indirect mechanisms
- Induced mechanisms
Categories of ED Impact Mechanisms

Transportation System Improvement

Change in Transportation System Parameters (Travel Time, etc.)

Change in User Costs

Change in Business Costs and Markets

Direct Impacts

Change in Business Activity (Output) of Directly Affected Businesses

Indirect Impacts

Change in Supply Purchases (Capital Investments)

Change in Average and Total Worker Wages

Change in Earnings Retention (Profit, Reinvestment)

Induced Impacts

Change in Business Activity of Suppliers

Change in Business Activity of Consumers

Total Direct, Indirect and Induced Impacts

Regional Output (Business Sales), Gross Regional Product (Value Added)
Wages (Personal Income), Jobs (Employment)

Dynamic Impacts Related to Economic Development

Property Values
Land Use/Development
Environment
Government Revenue and Costs
Categories of ED Impact Mechanisms

Transportation System Improvement

Change in Transportation System Parameters (Travel Time, etc.)

Change in User Costs

Change in Business Costs and Markets

Change in Business Activity of Directly Affected Businesses

Change in Business Activity of Suppliers

Change in Average and Total Worker Wages

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Change in Business Activity of Consumers

Direct Impacts

Indirect Impacts

Induced Impacts

For a Business organization:

↓ Crashes, ↓Safety Cost, ↓Workers lost to crashes

↑Travel Speed, ↓Travel Time, ↓Time spent in production

↓Decreased VOC, ↓Cost of fleet maintenance

Total Direct, Indirect and Induced Impacts

Regional Output (Business Sales), Gross Regional Product (Value Added)
Wages (Personal Income), Jobs (Employment)

Dynamic Impacts Related to Economic Development

Property Values
Land Use/Development
Environment
Government Revenue and Costs
For a Business organization:
Savings from reduced costs of travel time, safety and VOC
Thus, increased funding available for:
- purchasing new equipment, etc
- pay workers more
- declare higher profits
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Overall, improved environment for increased investment
Categories of ED Impact Mechanisms

For Workers and their Families in a Region:
- Increased incomes
- Increased purchasing power
- Increased patronage of services, retail, schooling, etc.

↓ Personal Travel Costs
↑ Job Access
↑ Quality of Life
### Categories of ED Impact Mechanisms

A Summary …

<table>
<thead>
<tr>
<th>User Benefit</th>
<th>Corresponding Cost Savings to Business</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time Savings</strong>—business travel (&quot;on-the-clock&quot; worker time)</td>
<td>Value of additional productive labor hours (for non-salaried portion of workers)</td>
</tr>
<tr>
<td><strong>Time Savings</strong>—other trips (includes commuting)</td>
<td>(May lead to additional spending or affects wages for recruiting workers.)</td>
</tr>
<tr>
<td><strong>Operating Cost Savings</strong>—business travel (pickups and deliveries)</td>
<td>Direct cost savings</td>
</tr>
<tr>
<td><strong>Operating Cost Savings</strong>—other travel (includes commuting)</td>
<td>Increase in disposable personal income. (May also affect wage rates.)</td>
</tr>
<tr>
<td><strong>Safety Improvements</strong>—business travel (&quot;on-the-clock&quot; worker time)</td>
<td>Reduction in insurance costs and worker absenteeism</td>
</tr>
<tr>
<td><strong>Safety Improvements</strong>—other travel</td>
<td>Reduction in insurance cost, raising disposable income</td>
</tr>
</tbody>
</table>

*Dynamic Impacts Related to Economic Development:
- Property Values
- Land Use/Development
- Environment
- Government Revenue and Costs*
Economic Impact Analysis Framework

1. Identify the Type of Transportation Project
2. Identify the Purpose of the Analysis
3. Select the Base Case and the Transportation Alternatives
4. Select the Appropriate Geographical Study Area
5. Select the Appropriate Time Period for the Study
6. Select the Appropriate Impact Measure
7. Select the Appropriate Analysis Methods
8. Apply Data to Calculate the Economic Impacts
9. Present Results

[Sources: Weisbrod, 1997; Weisbrod and Forkenbrock, 2001]
Step 1: Identify Characteristics of the Transportation Project

- What is the **mode** of the transportation improvement: highway, railway, waterway, air transportation?

- What is the **network feature** of the system under investigation:
  - line feature (highway or railway link)
  - node feature (intersection, interchange, rest stops, terminals, etc.)?

- What is the **entity** to be transported: freight or passengers or both?
Step 1 (continued)

- **Scope** of the project: Does new (or improved) system cover a specific site, strip or corridor, or entire system-wide area such as city or county?

- **Intended efficacy**: Will the project …
  
  (i) maintain  
  (ii) expand  
  (iii) upgrade  

  service for an existing transportation system
Step 2: Establish the Purpose of the Analysis

- Evaluation to Support (or Oppose) Proposed Investments
- Part of a Special Economic Development Program
- Responding to Stated Local Concerns
- Planning Purposes and Fulfillment of Regulatory Mandate
- Post-Implementation Evaluation
- Public Education
- Concern about Possible Adverse Impacts
Step 3: Define the Base Case and Other Alternatives

- Base case typically is the “Do-Nothing” Alternative

- Base case should provide a realistic representation of conditions (past, current, or possible future) associated with the base case.

- Base case scenario and other scenarios may differ on the basis of mode, facility size, type and location, area served, or other attributes etc.
Step 4: Define the Spatial (Geographic) Scope

- The area of jurisdiction for the agency or government that is sponsoring the study (neighborhood, city, county, state or province, nation, or an economic community of nations).

- The area of direct project influence (area within which users and non-users are affected by the transportation stimulus).

- Spatial scope definition reflects an interest in distributional ED impacts in an area.
### Step 5. Establish a Time Period of Analysis

<table>
<thead>
<tr>
<th>From Step, If the Purpose of the Analysis is to carry out …</th>
<th>Then the Time Period for the ED Evaluation should be …</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact assessment of proposed new services</td>
<td>A future year or period of time after new service opens</td>
</tr>
<tr>
<td>Benefit Cost analysis for proposed new services</td>
<td>A period of time from start of financing through life span of project</td>
</tr>
<tr>
<td>Public education on existing services</td>
<td>The current year</td>
</tr>
<tr>
<td>Public education on proposed new services</td>
<td>A future year or period of time after new service opens</td>
</tr>
<tr>
<td>Research study of existing services</td>
<td>Period of time including pre- and post-project time periods</td>
</tr>
</tbody>
</table>

Step 6. Select Your ED Impact Measures

- Regional output
- Gross regional product (GRP)
- Jobs (Nr. and Quality)
- Wages and other income
- Number of businesses
- Business volume and sales;
- Private investment in buildings, plant, and equipment
- Real estate values
- Population
Step 7: Select the Tool(s) for Your Analysis

- Surveys and Interviews
- Case Studies
- Econometric Models
  - Multiple Regression Models
  - Cluster Analysis
- Economic Models
  - I/O Accounting Models (IMPLAN, RIMS II)
  - Simulation Models (REMI)
- Hybrid Models
  - Traffic and Economic Models (MCIBAS)
  - Land-Use and Economic Models (TELUS, MEPLAN)
Step 7. Analysis Tools (cont’d)

[Source: Calspan-UB Research Center, Inc. et al., 2001]
STEP 7 -continued
(What is I-O Analysis?)

- I-O models, capture inter-industry linkages of a regional economy and estimate output, income and employment economic multipliers.

- With some expectations on the direct effects, I-O models estimate associated indirect and induced effects.

- Applicable for estimating the effects of construction spending.
STEP 7 -continued
(Existing Models for I-O Analysis)

- **RIMS II (BEA):** *Spreadsheet Analysis based on BEA’s National I-O Table and BEA’s Regional Economic Accounts.*
  - Low cost; user friendly; ready-to-use tables of multipliers.
  - Multipliers can be compared across areas.
  - No need to inflate or deflate the data.
  - Approximate order-of-magnitude estimates of impacts; best suited for estimating the impacts of small changes on a regional economy.

**IMPLAN (Minnesota IMPLAN Group, Inc.):**
- Flexibility in model construction.
- Individual estimates of direct, indirect and induced effects.
- More costly and more complex than RIMS II.
- Need to inflate or deflate the data
The Regional Economic Simulation Model (REMI)

- Dynamic/long-term effects.
- Suitable for estimating impacts resulting from transportation investments.
- Provide wide range of outputs.
- Consider population migration changes.
- High level of complexity.
- Extensive amount of data required.
- Special staff training.
- High cost.
The Regional Economic Simulation Model (REMI)

**REMI Model Structure (2002 - )**

- **Output**
- **Population & Labor Supply**
- **Labor & Capital Demand**
- **Wages, Costs & Prices**
- **Market Shares**

Dashed lines (---) represent Economic Geography Linkages
STEP 7 -continued

The Regional Economic Simulation Model (REMI)

What effect would Policy x have?

Change in policy variables associated with Policy x

The REMI Model

Baseline values for all policy variables

Alternative Forecast

Control Forecast

Compare Forecasts
The Regional Economic Simulation Model (REMI)

Models that link an econometric model to an I-O Model.

- Dynamic/long-term effects.
- Suitable for estimating impacts resulting from transportation investments.
- Provide wide range of outputs.
- High level of complexity.
- Extensive amount of data required.
- Special staff training.
- High cost.
Step 8. Apply Data to Estimate ED Impacts

- **Business Cost Savings**

- **Economic Benefits**
  - Direct effects of construction spending
  - Indirect and induced effects
  - Long-term benefits
    - Increased JOBS
    - Increased OUTPUT and PRODUCTIVITY
    - Increased INCOME
Step 9. Present Your Results

- **Description of benefits resulting in a given year**
  - applicable for impact assessments, public relations evaluations, and research studies in which there is a stable post-project impact.

- **Description of benefits as a stream over time**
  - applicable for impact assessments, public relations evaluations, and research studies in which the post-project impact varies over time.

- **ED Impacts could be used for**
  - Multi-objective Analysis
  - Economic Efficiency (if all benefits can be monetized)
A Review of Past EDI Studies

- Early 1960s-focus on econ. dev. impacts of Interstate construction
- Since 1980s-focus on the link between transportation & econ. dev.
- 1990s-studies claimed substantial econ. growth impacts
- 2000s-studies claim declining returns on transportation investment

- AASHTO, 1990-role of transportation in the economy
- NCHRP Synthesis 290 (2000)- current practices
- FHWA-national productivity impacts of hwy spending (1990s)
- FHWA, 2001-empirical info to measure econ impacts of hwys
- EDR Group-review of state econ dev programs
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- AASHTO, 1990-role of transportation in the economy
- NCHRP Synthesis 290 (2000)- current practices
- TCHRP 35 (1998)- econ. impact analysis of transit investments
- FHWA-national productivity impacts of hwy spending (1990s)
- FHWA, 2001-empirical info to measure econ impacts of hwys
Thank you