

Estimating Economic Development Benefits for Transportation Investment: The State of the Art

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Topics

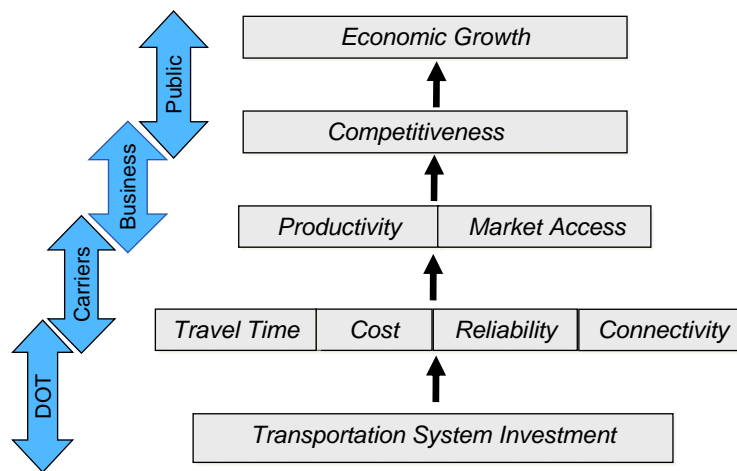
1. The Problem of Economic Models
2. Economic Development Factors
3. Ways to Develop & Use Economic Impact Assessment
4. Modular Approaches to Improve Analysis

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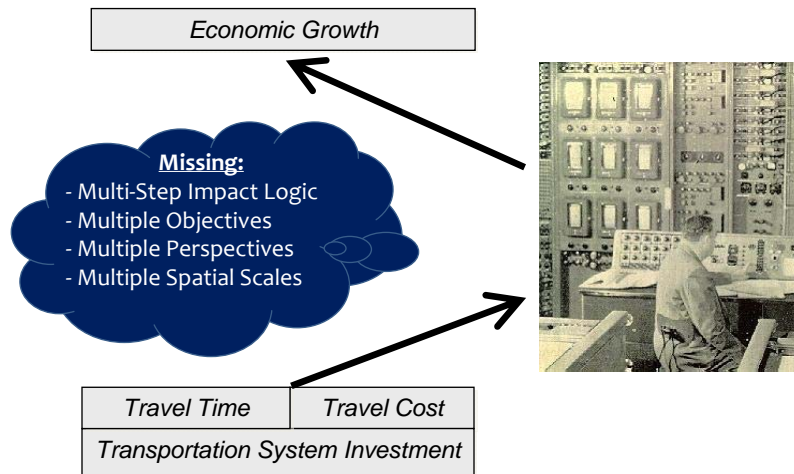


The Problem with Economic Models

The Real World: Multi-Stage Impacts & Perspectives



"Black Box" Models



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Role of Econ Impact in Decisionmaking

Funding Decision

How much money should we invest in transportation?

Programming Decision

How to allocate for preservation, capacity, modal programs?

Prioritizing Decision

How to rank and select among competing projects?

Planning Decision

What route alignment and design configuration to select?

Financing and Fee Decision

How to involve users, private providers, etc.

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Need for Multiple Perspectives

Stages of Planning and Decision-making

- funding
- programming
- prioritization
- planning

Different Spatial Levels of Impact

- local
- state
- federal

Different Impact Groups

- public
- business
- carriers
- government

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Economic Development Factors

*that need to be accounted for
in transportation impact assesment*

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Not All Transportation Investment Has the Same Payoff



Connectivity and setting matters

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Economic Benefits -- from 2 Sources

Traditional Efficiency Perspective:

Improving Throughput – Δ Speed, Distance, Delay
→ Saving Time and Expense for current travelers and existing businesses

Economic Development Perspective:

Improving Access /Connectivity – Δ market reach, intermodal interchange → facilitating new job access , new business markets

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Frequently Missed Factors

Affecting Productivity & Competitiveness

- **Market Access**
 - Worker markets
 - Supplier markets
 - Customer markets

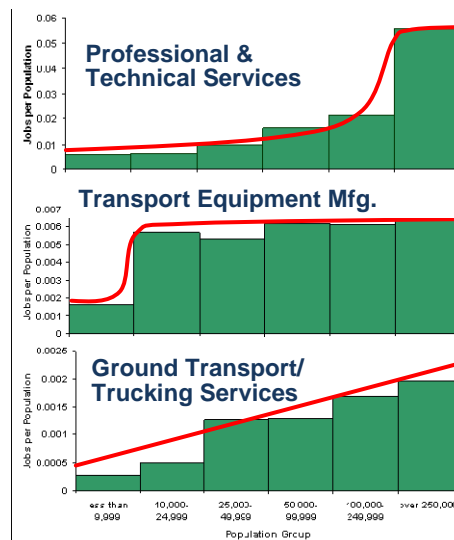
- **Connectivity & Reliability**
 - Airports, Marine ports, Inter-modal rail terminals,
 - Industrial Parks
 - Visitor Attractions



Market Access: Market Scale

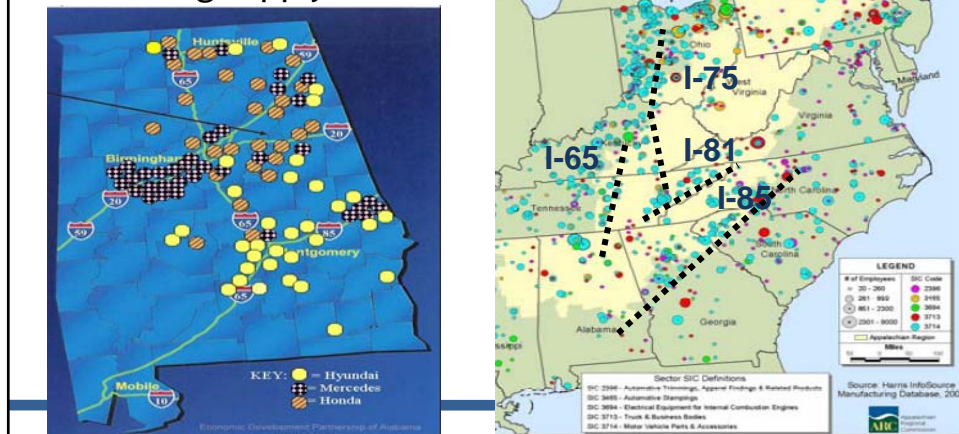
- Travel times change commuting labor market size

- Expanding labor markets enable new forms of economic activity

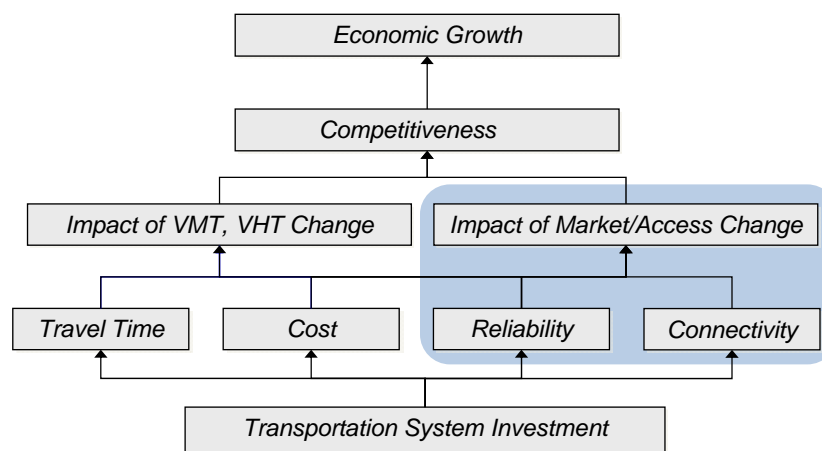


Delivery Access : Supply Chains

- Travel time & reliability changes affect same-day delivery areas and inter-modal access (rail, air)
- Enabling supply chain corridors



Analysis Steps



Ways to Develop and Use Economic Development Impact Assessment

- Direct Designation
- Qualitative Ratings
- Quantitative Performance Measures

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Direct Assessment: *Economic Development Routes*

Step 1. Identify routes and facilities that have a large potential for economic impact.

Screening Criteria

- Serves hwy or rail corridors and industrial centers
- Serves distribution/warehousing routes and centers
- Connects to airport, marine port or land gateways
- Serves convention, tourism, banking and commerce that brings in visitors, money



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Direct Assessment: Economic Development Routes

Step 2. Measure the sensitivity of economic activities to those facilities.

Sensitivity Criteria

- Vehicle Mix/Purpose – service to freight and visitors
- Origin-Destination – serves flows to outside regions
- Intermodal Connectivity – ground to air/sea gateways
- Economic Connectivity –to industrial, warehouse and export business services



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Direct Assessment: Economic Development Routes

Step 3. Estimate potential economic benefit from making improvements (or loss if not made).

Types of Changes

- Travel Time to intermodal terminals, global gateways
- Predictability (stability) of travel time
- Size of same-day delivery market
- Access restrictions on truck use

Vancouver, BC Region
Chicago, IL Region



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Qualitative Rating Systems

Measurement Methods

- Scorecard
- Multi-dimension scales
- Relative ranking

Economic Development Factors

- Enhancing Market Access
- Enhancing Intermodal Connectivity
- Enhancing Competitiveness

Economic Development Outcomes

- Job creation & retention
- Private investment
- Redeveloping distressed areas

Qualitative Rating: Econ Criteria

| Criteria | OH | WI | MN | MO | VA | Scot |
|---|----|----|----|----|----|------|
| <i>Transportation Drivers of Economic Impact</i> | | | | | | |
| Multi-modal & intermodal facilities | X | - | X | X | X | X |
| Connectivity to key statewide corridors | - | X | - | X | - | X |
| Supports desired land development clusters | - | X | - | X | - | X |
| Predictability of travel times | - | - | X | - | - | X |
| Connectivity or access to global markets | - | - | X | - | - | - |
| Concentration of trucks for goods movement | - | - | - | - | X | - |
| Enhances competitiveness of shipping rates | - | - | X | - | - | - |
| Reduces bottlenecks and size/wt. impediments | - | - | X | X | - | - |
| Supports economic development initiatives | - | - | - | X | - | - |
| Supports redevelopment of old industrial areas | X | - | - | - | - | - |
| Location in economically distressed area | X | - | - | X | X | - |
| <i>Economic Growth Outcomes</i> | | | | | | |
| Job Creation – supports industry attraction | X | X | - | - | - | X |
| Job Retention – supports existing industry | X | X | - | - | - | X |
| Public-private participation in funding | X | - | - | - | - | - |

Quantitative Measurement Systems

Transportation Performance Changes

- Travel times, cost, reliability, volumes, safety

Economic Development Factors

- Access, Connectivity, Competitiveness

Economic Development Outcomes

- Job growth, investment, distress

Stakeholder Perspectives

- Public, businesses, carriers, commuters, DOTs

Quantitative Systems Economic Model Factors

- cost of commuting
- cost of freight movement
- Schedule reliability
- breadth of same-day delivery market
- breadth of labor market
- access drive time to airport
- access drive time to marine port
- access drive time to intermodal terminal
- access time to international gateways
- level of service at ports and terminals
- constraints on classes of vehicles

*Impact
Differs by
Industry*

*Portland, OR Region
Chicago, IL Region
Houston, TX Region
Massachusetts EOT
Wisconsin DOT
Kansas DOT
Oregon DOT
Maine DOT*

Quantitative System: Comparing Projects

| Stakeholders | Performance Measures | Existing | No Action | Alt. A | Alt. B |
|--------------|----------------------------------|----------|-----------|--------|--------|
| Public | Jobs & Income | | | | |
| | Safety / Security / QOL | | | | |
| | Cost of Living | | | | |
| Business | Delivery Cost & Reliability | | | | |
| | Market Access & Scale | | | | |
| | Operating Productivity | | | | |
| Carriers | Profitability / Competitiveness | | | | |
| | Driver, Vehicle & Fuel Costs | | | | |
| | Service Frequency | | | | |
| | Speed & Reliability | | | | |
| Commuters | Market Share | | | | |
| | Travel time & reliability | | | | |
| | Travel-related cost | | | | |
| DOT | Travel Safety / Security | | | | |
| | System Efficiency | | | | |
| DOT | System Operating Cost & Revenue | | | | |
| | System Safety | | | | |
| | Energy, Environment Social Goals | | | | |

Quantitative Systems in Practice: Comparing Alternatives - Travel & Access

| Travel Performance: commuting, freight delivery, reliability, safety | | | | |
|--|----------|---------------|-------------|--------------|
| Savings or Reduction in | Pass Car | Truck Freight | Bus Transit | Rail Freight |
| Gross VMT | 0 | 0 | 0 | 0 |
| Gross VHT | 0 | 0 | 0 | 0 |
| Gross VHT w/reliability adj | | | | |
| Passenger Trips | | | | |
| Passenger Miles | | | | |
| ...from mode shift | | | | |
| ...induced | | | | |
| Freight Tons | | | | |
| Freight Ton Miles | | | | |
| ...from mode shift | | | | |
| ...induced | | | | |
| Fatalities | | | | |
| Personal Injuries | | | | |
| Property Damage | | | | |
| Total Value of Travel Imp | | | | |
| Passenger Cost - Net Total | | | | |
| Crew Cost - Net Total | | | | |
| Freight Logistics Cost - Net | | | | |
| Veh Oper - Net Total | | | | |
| Toll Cost - Net Total | | | | |
| Safety Cost - Net Total | | | | |
| Environmental Costs - Total | | | | |

| Travel Access: labor market, delivery, inter-modal terminal access | | | | |
|--|----------------|-------------------|-------------------|-------|
| Industry | Road Labor Mkt | Road Delivery Mkt | Rail Delivery Mkt | |
| Crop Production | 0.000 | 0.000 | 0.000 | 0.000 |
| Animal Production | 0.000 | 0.000 | 0.000 | 0.000 |
| Forestry & Logging | 0.000 | 0.000 | 0.000 | 0.000 |
| Wood Products | 0.000 | 0.000 | 0.000 | 0.000 |
| Paper Manufacturing | 0.000 | 0.000 | 0.000 | 0.000 |
| Printing & Related Support Activities | 0.000 | 0.000 | 0.000 | 0.000 |
| Petroleum & Coal Products | 0.000 | 0.000 | 0.000 | 0.000 |
| Chemical Manufacturing | 0.000 | 0.000 | 0.000 | 0.000 |
| Plastics & Rubber Products | 0.000 | 0.000 | 0.000 | 0.000 |
| Nonmetallic Mineral Products | 0.000 | 0.000 | 0.000 | 0.000 |
| Primary Metal Manufacturing | 0.000 | 0.000 | 0.000 | 0.000 |
| Fabricated Metal Products | 0.000 | 0.000 | 0.000 | 0.000 |
| Machinery Manufacturing | 0.000 | 0.000 | 0.000 | 0.000 |
| Computer & Electronic Products | 0.000 | 0.000 | 0.000 | 0.000 |

Quantitative Systems in Practice: Comparing Economic Impact and Benefit/Cost

Economic Impact: jobs, income, value added (GRP), shipments

| Year | Business Output (\$ mil.) | Value Added (\$ mil.) | Jobs | Wage Income (\$ mil.) |
|------|------------------------------|--------------------------|------|--------------------------|
| 2007 | 5,535 | 2,715 | 55 | 2,109 |
| 2008 | 5,535 | 2,715 | 55 | 2,109 |

Benefit/Cost: user, economic, state and societal perspectives

| Year | Mode | (A) Traveler Benefits | | | | | (B) Shipper Logistics Cost | (C) Other Benefits | |
|------|-----------------------------|-----------------------|------------|---------------------------|-------------|-----------------------|----------------------------------|---------------------|--------------------------|
| | | Vehicle Costs | Time Costs | Non - \$ Value of Time | Safety Cost | Induced Adjustment | | Social/ Environ. | Business Productivity |
| 2009 | | | | | | | | | |
| 2010 | | | | | | | | | |
| 2011 | | | | | | | | | |
| 2012 | | | | | | | | | |
| 2013 | | | | | | | | | |
| 2014 | | | | | | | | | |
| 2015 | | | | | | | | | |
| 2016 | | | | | | | | | |
| 2017 | Pass Car/L1.Truck | -11.2 | 1373.4 | 1306.7 | -5.3 | 479.6 | 0.0 | -1.1 | 0.0 |
| 2018 | Truck Freight | -6.8 | 953.7 | 0.0 | -0.3 | 486.7 | 1160.8 | -1.7 | 0.0 |
| 2019 | Bus Transit | 0.0 | 139.2 | 139.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2020 | Rail Freight | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2021 | Rail Transit | 0.0 | 173.7 | 147.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | | | | | | | | | |
| 2023 | | | | | | | | | |
| 2024 | Traveler Benefit | | | | 5176 | | 802 | | 4374 |
| 2025 | Full User Benefit | | | | 6337 | | 802 | | 5534 |
| 2026 | Total Societal Benefit | | | | 6334 | | 802 | | 5532 |
| | Economic Development Impact | | | | 1724 | | 802 | | 921 |

Transportation Economic Development Impact System

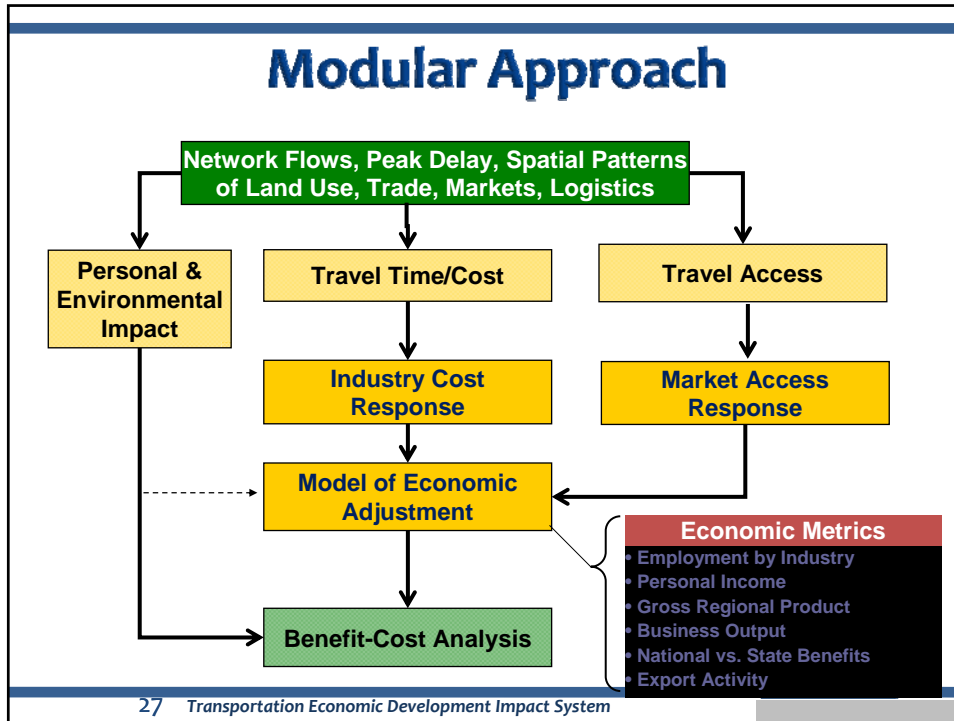


Concept: Multi-Modal, Multi-Regional, Spatially-Aware Economic Framework

TREDIS as a “Modular Framework” allows for...

- multi-modal – highway, transit, rail, air, water modes
- any travel model (EMME2, TransCad) or sketch planning data
- any economic model (REMI, CRIO-IMPLAN, Global Insight)
- any specialized analysis (land use model, freight model, BEST)
- incorporates economic distress and access factors via business attraction analysis (LEAP) and GIS (ESRI)
- works at zone, municipal, county and state levels
- results for multiple perspectives and spatial scales





Modular Approach in Practice

Programming: Preservation vs. New Capacity
 Michigan DOT and Kansas DOT: applied bridge & pavement management systems with TREDIS framework

Land Use and Economic Development Impacts
 Oregon DOT and California HSR Authority: apply integrated transportation and land use models with TREDIS framework

Freight Planning
 Wisconsin DOT and Massachusetts EOT: applying TransSearch freight data with TREDIS framework

Business Competitiveness
 Vancouver, Portland, Chicago business organizations: applied port, terminal data with TREDIS framework

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The Future – New Technologies

Actual Photo of UFO Landing Zone on the A27 Highway in the Netherlands



MICHAEL KOOPANREUTERS

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