Transportation Accessibility and Industrial Land Use

Implications for Economic Development

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Introduction

• Decision-makers care more about the broader implications of transportation investments than the direct benefits
  – E.g., jobs, development, increased tax revenue, etc.

• Industrial land use affects regional economic dynamics and plays an important role in economic development
  – Higher paying jobs; supports other regional economic activities
  – Industrial activities are transportation intensive and drivers of freight movements

• Study considers the economic development implications of improved transportation accessibility
  – Industrial land use serves as a proxy for the economic benefits of transportation investments instead of more conventional measures
Industrial Land Consumption as a Proxy for Economic Development

• Why use industrial land consumption to gauge the effects of transportation investment?
  – Amount of land consumed is an important planning and revenue consideration
    • Zoning, industrial land use studies
    • Property tax revenue
  – Captures factors that may be overlooked when using employment and number of firms as proxies
    • Firms can increase production without increasing employees
Agenda

• Background
  – Transportation-Land Use
  – Transportation-Economic Development

• Spatial Econometric Analysis of Industrial Land Use and Economic Development
  – Study Area and Data
  – Model Results

• Economic Development Implications
  – Industrial Land Use Studies
  – Potential Policy and Strategy
Transportation-Land Use Relationship

The Urban System

TRANSPORTATION

ACTIVITY PATTERNS

ACCESSIBILITY

LAND USE

Transportation-Land Use Relationship (2)

• Interdependency expressed over long periods of time

• Prior studies: Simulation and empirical study most common methodological approaches
  – Integrated urban planning models allow activities (jobs and residences) to respond to changes in transportation system
  – Empirical studies use “quasi-experimental designs” as substitutes for standard research designs
Transportation-Economic Development Relationship

Figure 1 in Targa, F. et al. Economic Activity and Transportation Access.: An Econometric Analysis of Business Spatial Patterns, Transportation Research Record, No. 1932, 2005.
Transportation-Economic Development Relationship (2)

• Likewise interdependent

• *Prior studies*: empirical studies the most common methodological approach
  – Most consider highway investment only
  – Common measures of economic development
    • Economic productivity and overall economic effects
    • Jobs created and firms located/relocated
A Spatial Econometric Analysis of Industrial Land Use and Economic Development
Study Area: Greater Los Angeles, CA

The four-county region is divided into 108 submarkets.
# Data Sources

<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real estate</td>
<td>Gross absorption / Occupancy</td>
<td>CB Richard Ellis</td>
</tr>
<tr>
<td>Demographics</td>
<td>Population estimates</td>
<td>2010 U.S. Census</td>
</tr>
<tr>
<td>Transportation Infrastructure</td>
<td>Amount of streets, highways, and rail</td>
<td>2010 U.S. Census TIGER / Line Shapefiles</td>
</tr>
<tr>
<td>Road Distance / Travel Time</td>
<td>Distances and normal travel times between submarkets</td>
<td>Mapquest</td>
</tr>
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# Primary Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Mean</th>
<th>Std. Dev.</th>
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<tbody>
<tr>
<td>Gross Abs. Intensity</td>
<td>Total occupied industrial space (square miles) / Total submarket area (square miles)</td>
<td>3.426e-05</td>
<td>5.195e-05</td>
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<tr>
<td>Population Density</td>
<td>Persons per square mile</td>
<td>6,683</td>
<td>4,576</td>
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<tr>
<td>Rail Accessibility</td>
<td>Miles of Class I rail per square mile</td>
<td>0.609</td>
<td>0.6937</td>
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<tr>
<td>Port Accessibility</td>
<td>Over-the-road miles to the ports of LA/ LB</td>
<td>32.37</td>
<td>21.49</td>
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</table>
Gross Absorption over Time for Greater Los Angeles, CA
Potential Agglomeration Effects

Gross Absorption/Area at the submarket level

Clusters of industrially intense submarkets
Model and Results

\[ Y_i = \beta_0 + \rho W_y + \beta_1 \times \text{Population Density} + \beta_2 \times \frac{\text{Miles of Class I Rail}}{\text{Square Miles}} + \beta_3 \times \text{Distance to Ports of LA/LB}^{-1} + \beta_4 \times \text{Distance to Ports of LA/LB}^{-2} + \epsilon \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-statistic</th>
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<tr>
<td>( \rho )</td>
<td>1.681</td>
<td>2.284</td>
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<tr>
<td>Intercept</td>
<td>-1.223</td>
<td>-1.01</td>
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<tr>
<td>Population Density</td>
<td>-0.0006</td>
<td>-4.745</td>
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<tr>
<td>Class I Rail</td>
<td>3.270</td>
<td>5.311</td>
</tr>
<tr>
<td>Distance to LA/LB(^{-1})</td>
<td>200.1</td>
<td>4.243</td>
</tr>
<tr>
<td>Distance to LA/LB(^{-2})</td>
<td>-1182</td>
<td>-4.176</td>
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<tr>
<td>R-Squared</td>
<td>0.4261</td>
<td></td>
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Results: Potential Effects on Land Use

For a given a submarket:

• 1% increase in *Population density* =
  -26,273 average decrease in square feet; or -$173,000 in lost rent per year

• 1% increase in *Rail accessibility* =
  +533,178 average increase in square feet; or $3.52 million gained in rent per year

• A 1% increase in *Port accessibility* =
  +52,351 average increase in square feet; or $345,516 gained in rent per year
Consistency with Firm Location Studies

• Results are consistent with firm location/relocation studies

• Generally, firms value:
  – Accessibility to markets and infrastructure
  – Proximity to other firms
  – Affordability
  – Sufficient site characteristics
  – Economic considerations: labor, local tax policy, etc.
Economic Development Implications
ILU Studies

- Primary vehicle to inform industrial land policy and economic development strategies
- Market- or Planning-based
  - Market-based: Strategies to increase demand
  - Planning-based: Strategies to preserve land

Several regions have conducted ILU studies
- Chicago, IL; Los Angeles, CA; Denver, CO; and Boston, MA among others

Source: Google Maps and UC Berkeley Center for Community Innovation
Implications for ILU Studies

• Issues with ILU studies
  – Disconnect from formal industrial location theory and history
  – Role of transportation not always highlighted
  – Opportunity to engage the policy and economic development community

• Analysis supports both approaches and provides connection to formal theory
  – Market-based: Insight into the effects of increased accessibility
  – Planning-based: Identifies clusters of industrial activity

Implications for Economic Development Policy and Strategy

• Potential ILU Policy and Strategy Recommendations
  1. Discourage residential development in industrial corridors
     • Population density negatively affects consumption
     • Conversion to residences may make areas less desirable to remaining industries
       – i.e., Hours-of-operation restrictions, neighborhood complaints, etc.
  2. Prioritize transportation investment in industrial corridors
     • Rail and Port accessibility positively affects consumption
     • Investments in infrastructure likely to encourage industrial land consumption
  3. Reconsider which industrial areas warrant subsidies

• Common recommendations, but offered with more empirical justification and connected to industrial location theory
Thank you