Intraurban Accessibility and Employment Density: Evidence from the Twin Cities

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Research Team

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Urban Agglomeration Economies

Returns to urban size
Productivity effects
3 to 8 percent (Rosenthal and Strange 2004)
4 percent (Melo et al. 2009 meta)

Relationship to infrastructure
Public capital stocks as input
Attenuates congestion effects of size
Facilitates interactions among firms
## Sources of Urban Scale Economies

<table>
<thead>
<tr>
<th>Internal</th>
<th>Technological</th>
<th>1. Pecuniary</th>
<th>Being able to purchase intermediate inputs at volume discounts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Static Technology</td>
<td>Falling average costs because of fixed costs of operating a plant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Dynamic Technology</td>
<td>Learning to operate a plant more efficiently over time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. “Shopping”</td>
<td>Shoppers are attracted to places where there are many sellers</td>
<td></td>
</tr>
<tr>
<td>Localization</td>
<td>Static</td>
<td>5. “Adam Smith” specialization</td>
<td>Outsourcing allows both the upstream input suppliers and downstream firms to profit from productivity gains because of specialization</td>
</tr>
<tr>
<td></td>
<td>6. “Marshall” labor pooling</td>
<td>Workers with industry-specific skills are attracted to a location where there is a greater concentration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dynamic</td>
<td>7. “Marshall-Arrow-Romer” learning by doing</td>
<td>Reductions in costs that arise from repeated and continuous production activity over time and which spill over between firms in the same place</td>
</tr>
<tr>
<td>External or Agglomeration</td>
<td>Static</td>
<td>8. “Jane Jacobs” innovation</td>
<td>The more that different things are done locally, the more opportunity there is for observing and adapting ideas from others</td>
</tr>
<tr>
<td>Urbanization</td>
<td></td>
<td>9. “Marshall” labor pooling</td>
<td>Workers in an industry bring innovations to firms in other industries; similar to no. 6 above, but the benefit arises from the diversity of industries in one location</td>
</tr>
<tr>
<td></td>
<td>Dynamic</td>
<td>10. “Adam Smith” division of labor</td>
<td>Similar to no. 5 above, the main difference being that the division of labor is made possible by the existence of many different buying industries in the same place</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11. “Romer” endogenous growth</td>
<td>The larger the market, the higher the profit, the more attractive the location to firms, the more jobs there are, the more labor pools there, the larger the market—and so on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12. “Pure” agglomeration</td>
<td>Spreading fixed costs of infrastructure over more taxpayers; diseconomies arise from congestion and pollution</td>
</tr>
</tbody>
</table>

Source: Kilkenny (1998); World Bank (2009)
Conceptual and Measurement Issues

- Spatial variation in agglomeration with urban areas
- Transportation as a service flow, not a stock
- Allow for localization, as well as urbanization as source of agglomeration
  - *Urbanization*: access to firms in all industries, geographically widespread (external to firms and their industries)
  - *Localization*: access to firms in same industry, sharply attenuates with distance
Variable Definition

- **Urbanization**
  - Proxied by access to regional employment (30 min)

- **Localization**
  - Proxied by access to *same-sector* employment within 10 min
Access to Jobs – Same Sector (Localization)

Accessibility to jobs
NAICS 52: Finance and Insurance
within 10 minutes by car

- 0-1,000
- 1,000-2,500
- 2,500-5,000
- 5,000-7,500
- 7,500-10,000
- 10,000-25,000
- 25,000-50,000
- 50,000-75,000
- 75,000-100,000
- 100,000-250,000
- 250,000-500,000
- 500,000-750,000
- 750,000-1,000,000
- 1,000,000+

Highways

Zone Structure Displayed: Transportation Analysis Zone
Primary Data Resources: TomTom Speed Data, Metropolitan Council

Nexus Research Group
Empirical Implementation

Employment density as a proxy for productivity
Relationship to accessibility (by sector)
Localization vs urbanization effects
Regressions for 20 NAICS 2-digit sectors
Estimates for 2000 and 2010
TAZs as units of analysis (N = 1,200)
Negative binomial specification
Count data
Accounts for large number of zones with zero employment
Data Sources

- Employment density
  - LEHD (LODES) workplace-based at block level
  - Aggregated up to TAZ level

- Accessibility/Travel Time
  - Met Council regional forecasting model
  - TomTom
Data Compatibility

Accessibility measured at TAZ level, employment at block level
Employment aggregated to TAZs
LEHD available since 2002
Matched to 2000 accessibility data
Accessibility for 2000 and 2010 measured differently
Modeled flows vs. link-based measurements (TomTom)
## Urbanization/Localization Elasticities and Ranks

<table>
<thead>
<tr>
<th>Industry</th>
<th>Urbanization</th>
<th>Rank</th>
<th>Localization</th>
<th>Rank</th>
<th>Urbanization</th>
<th>2000</th>
<th>Rank</th>
<th>Localization</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>-0.064</td>
<td>20</td>
<td>0.704</td>
<td>11</td>
<td>-0.228</td>
<td>19</td>
<td>0.759</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas</td>
<td>0.399</td>
<td>16</td>
<td>0.571</td>
<td>12</td>
<td>0.611</td>
<td>14</td>
<td>0.420</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Extraction</td>
<td>0.592</td>
<td>14</td>
<td>1.863</td>
<td>1</td>
<td>1.156</td>
<td>8</td>
<td>0.691</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td>0.029</td>
<td>19</td>
<td>1.449</td>
<td>3</td>
<td>-0.252</td>
<td>20</td>
<td>1.525</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>0.137</td>
<td>17</td>
<td>1.227</td>
<td>5</td>
<td>0.286</td>
<td>18</td>
<td>1.165</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.062</td>
<td>18</td>
<td>1.822</td>
<td>2</td>
<td>0.803</td>
<td>11</td>
<td>0.920</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>0.419</td>
<td>15</td>
<td>1.292</td>
<td>4</td>
<td>0.515</td>
<td>15</td>
<td>1.108</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Retail Trade</td>
<td>0.742</td>
<td>13</td>
<td>0.772</td>
<td>8</td>
<td>0.676</td>
<td>12</td>
<td>0.528</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>3.006</td>
<td>4</td>
<td>0.045</td>
<td>16</td>
<td>2.023</td>
<td>3</td>
<td>0.281</td>
<td>16</td>
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</tr>
<tr>
<td>Information</td>
<td>3.644</td>
<td>2</td>
<td>-0.157</td>
<td>18</td>
<td>3.188</td>
<td>1</td>
<td>-0.266</td>
<td>20</td>
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<tr>
<td>Finance and Insurance</td>
<td>4.019</td>
<td>1</td>
<td>-0.549</td>
<td>20</td>
<td>0.808</td>
<td>10</td>
<td>0.767</td>
<td>7</td>
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</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>3.339</td>
<td>3</td>
<td>-0.230</td>
<td>19</td>
<td>2.561</td>
<td>2</td>
<td>-0.114</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>2.223</td>
<td>5</td>
<td>1.010</td>
<td>6</td>
<td>1.452</td>
<td>7</td>
<td>0.814</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>2.159</td>
<td>6</td>
<td>0.292</td>
<td>14</td>
<td>1.813</td>
<td>4</td>
<td>0.310</td>
<td>15</td>
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<tr>
<td>Educational Services</td>
<td>0.798</td>
<td>12</td>
<td>0.569</td>
<td>13</td>
<td>0.501</td>
<td>16</td>
<td>0.557</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>1.131</td>
<td>10</td>
<td>0.769</td>
<td>9</td>
<td>0.835</td>
<td>9</td>
<td>0.710</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>1.419</td>
<td>9</td>
<td>0.960</td>
<td>7</td>
<td>0.468</td>
<td>17</td>
<td>0.934</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
<td>1.941</td>
<td>8</td>
<td>0.114</td>
<td>15</td>
<td>1.641</td>
<td>6</td>
<td>0.167</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Other Services [except Public Administration]</td>
<td>2.143</td>
<td>7</td>
<td>-0.054</td>
<td>17</td>
<td>1.800</td>
<td>5</td>
<td>0.069</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Public Administration</td>
<td>1.032</td>
<td>11</td>
<td>0.738</td>
<td>10</td>
<td>0.664</td>
<td>13</td>
<td>0.532</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

Notes: The indicator of localization economy includes industry-specific jobs in the observed zones. The numbers in the shaded cells are insignificant at the p < 0.05 level.
Key Findings

*Urbanization effects* tend to dominate localization effects
Consistent with other findings at higher levels of geographic aggregation (e.g. counties)
Localization elasticities tend to be smaller, confined to a few sectors (mfg., wholesale, retail)
*Service*-based sectors tend to have highest density elasticities
Key Findings (continued)

FIRE, Information, Arts/Entertainment, Mgmt of Companies

Traditional CBD-based industries
Significant variation in elasticities across sectors
Elasticities for 2010 generally larger than 2000
Network performance? Differences in firm/sector behavior? Measurement differences?
Study Limitations

Does not provide direct estimates of productivity effects
Lack of comparability of travel time sources
Limits ability to pool of difference data from other years
Delineation of localization economies
Future Directions

Allow degree of localization to vary by industry
Firm-level data
Production or cost function
Look at particular sources of agglomeration (e.g. labor pooling, specialization)
Acknowledgments

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