

Background

Transportation planners operating at the state or regional level often need to evaluate plans for improving freight and passenger connections between communities as well as ground connections with intermodal facilities. These changes in connectivity can be particularly important for regions with evolving population and economic patterns. In that regard, there has been increasing attention to the role of transportation corridor investments in expanding the accessibility of areas to surrounding markets and intermodal terminals and resulting regional economic consequences. However, much of the past attention on economic consequences has focused on urban business agglomeration rather than broader regional-scale access and connectivity for freight and passenger travel. There is thus a remaining need for transportation planners to better differentiate the economic benefits and impacts of different kinds of transportation investments in various locational contexts.

In order to evaluate the impacts of increased regional access, our research unites three complementary perspectives:

- 1) Transportation planning literature that distinguishes between types of transportation investments and plans
- 2) Site location literature, which defines business location decision processes and their respective spatial scales
- 3) Economic research, which provides a basis for defining scale economies and productivity effects

Data

The dataset is comprised of 3,053 counties within the contiguous 48 US States that are directly interconnected via highway and rail systems; these represent the study zones. Counties in the US define most small metropolitan areas, micropolitan areas, and rural labor market areas. They are building blocks for larger metropolitan areas. For each county, our dataset separately measures employment and mean wage for each of 316 industries – representing 4-digit NAICS codes.

- Local Employment: Longitudinal Employer Household Dynamics (LEHD)
- Population & Educational Attainment: American Community Survey (ACS)
- Regional Employment & Wages: Derived by IMPLAN using data from the BLS, BEA and Census Bureau.

For transportation facilities, we calculated the road drive time from the largest city in each county to the closest facilities identified by the National Transportation Atlas Database (NTAD) from the Bureau of Transportation Statistics (BTS) using the ArcGIS StreetMap network using HERE data.

- Commercial Intermodal Rail Terminals
- FAA Large and Medium Hub Airports
- Commercial Water Ports

Industry Cluster Definitions

Cluster Type	Maximizing Factors (urbanization economies)	Cluster Factors (localization economies)	Minimizing Factors (dispersion economies)
<i>High Tech: Metro-scale, Knowledge Clusters</i> (e.g., biotech, computer software products)	In metro areas with access to universities, airports, and a large base of educated workers with specialized skills	Locate with similar firms to gain knowledge spillovers (technology information sharing)	May avoid high rise office districts to reduce real estate cost
<i>Manufacturing: Peripheral, Corridor Clusters</i> (e.g., industrial parks, districts, corridors)	In regions where they can maximize truck access to parts suppliers and buyers (including assembly plants)	Concentrated at highway access routes to reach regional markets, rail connections (to national markets), or optimize same-day truck deliveries for just-in-time manufacturing	At the periphery of metropolitan areas and spread along intercity corridors to avoid congested roads
<i>Bulk Resource Processing Clusters</i> (e.g., agriculture, metal/mining products)	In rural areas with access to material resources	In the vicinity of rail/marine bulk loading facilities for national and global distribution	At periphery or outside urban areas to minimize land cost and road congestion
<i>Distribution/Logistics Clusters</i> (e.g., warehousing, distribution centers)	In and around major metro markets with intermodal terminals, to maximize reach for regional customers + global markets	Concentrated around intermodal terminals (especially airports) and highway intersections to maximize regional and global connectivity	At the periphery or adjacent to major metro areas to maximize available land and minimize land cost
<i>Visitor Services Clusters</i> (e.g., lodging, meals, recreation)	In areas that have visitor attractions along with a large regional population base for day trips	Largest clusters are near visitor attractions that are served by airports for access to national and international markets	Dispersed around the vicinity of the visitor sites or along access corridors to minimize congestion
<i>Producer Services: Office Clusters</i> (e.g., finance, insurance, business services)	In metro areas that have a broad regional workforce with required education and skills	Concentrated in office districts to maximize knowledge spillovers (learning benefits); at urban core and outlying transport nodes to maximize labor market reach	
<i>Consumer Retail Clusters</i> (shopping districts and centers)	Most highly concentrated in metro areas with a large surrounding customer base	At major transportation network nodes and clustered to create and share greater market power – with differentiated offerings	

Methodology

We developed two sets of regression models; the first predicts the magnitude of zonal employment in each industry while the second predicts zonal average wage for employees in each industry. We utilize a nonlinear regression with a natural log-log transformation, so regression coefficients represent elasticities. This nonlinear regression methodology allows us to estimate exponents that capture nonlinear scale and distance decay factors while simultaneously estimating coefficients, to optimize the goodness of fit of the model.

Emp Concentration(I), or Wage Rate(I)
= $f_n(\text{Local Market}_{n,t}, \text{Regional Market}_{n,t}, \text{Intermodal Market}_{n,t})$

where
Local Market = opportunities within a metropolitan, micropolitan or rural labor market area; Regional Market = opportunities reachable by ground access for same-day business, leisure, or freight delivery trips; Intermodal Market = destinations reachable by transfer from ground to air, water, or rail transportation networks.

P=population access (for labor market or customer markets), F=freight access (for industry supplier or buyer markets), T= terminal type (for access to broader national and global markets via air, water, rail).

Conclusions

The regression results show that the attraction of business activity (as reflected by employment concentrations) and associated productivity (as reflected by wage rates) are both greatest in locations with connectivity to markets, including local, regional and intermodal (long distance) markets. However, these effects differ significantly by industry

Local Market Access

- Employment concentration and wage rates for high tech and producer services are increased by having a larger population, and by having a more highly educated workforce.
- Effects of education and labor market size appeared to be independently important; a multiplicative interaction of these terms was not statistically significant.

Regional Market Access

- Important for the attraction of manufacturing and distribution activities (employment), and it is also a significant factor in manufacturing wages.
- For those industries, this variable serves as an indicator of the size of additional business supplier and buyer delivery markets that can be reached by same-day truck trips beyond the local market.

Intermodal Gateway Access

- Both producer services and high value (high tech) manufacturing particularly benefit from access to large airports for fast, time-sensitive travel to reach long distance markets.
- For distribution and visitor services, a high value is placed on having a large choice of intercity routes and schedule times (correlated with high airport activity level), more than they value minimization of travel time to reach the airport.
- Production of bulk products was associated with marine port connectivity, though the causation may be that transportation investments follow rather than lead the location of those business activities.
- Proximity to intermodal rail terminals is important for the location of manufacturing industries that were not classified as high tech.

Contact Us

Jenna Goldberg
jenna.goldberg@ebp-us.com

Glen Weisbrod
glen.weisbrod@ebp-us.com

