Title: Urban Spatial Structure, Employment Subcenters, and Freight Travel

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Project Objective

Metropolitan areas in the U.S. have become increasingly polycentric. Large employment subcenters have emerged outside of central cities, competing against the traditional city center for labor and businesses. This research uses the Los Angeles region as the case study seeks to understand the relationship between polycentric urban development patterns and freight travel.

Problem Statement

A half-century of dispersed spatial development has intensified polycentric urban spatial patterns. In major U.S. metropolitan areas, large population and employment subcenters have emerged outside of central cities, diminishing the role of the traditional city center as a destination for businesses. This changing nature and context of urban development presents challenges to many businesses trying to optimize goods and service delivery within existing transportation networks. However, the existing literature provides little insight into the impact of polycentric metropolitan development patterns on freight activity. This research enables us to estimate how freight travel is associated with different employment centers, providing insights into relationships between land use, industrial structure, and the use of the road and highway system by freight.

Research Methodology

Our study area is the Los Angeles combined statistical area, which includes the counties of Los Angeles, Ventura, Orange, San Bernadino, and Riverside. We identified 53 employment subcenters using employment data from the 2005 National Establishment Time Series (NETS) database. The freight data were obtained from the Southern California Association of Governments (SCAG). Aggregate freight vehicle kilometers travelled (VKT) was then calculated by summing up all freight travel distance for all links within employment hexagon. We also identified seven major intermodal terminals in the Los Angeles region from the 2011 National Transportation Atlas Database (NTAD). In terms of analysis, we created a statistical surface of freight flow and overlaid employment subcenters on top of the interpolated surface. Furthermore, we developed a statistical model that tests the effects of employment and types of industry

sectors. We focused particularly on employment in agriculture, construction, manufacturing, mining, professional services, retail, transportation, utilities and wholesale industries. Additional factors included in the mode are the presence of freeways and the distance to intermodal facilities.

Results

Figure 1 shows an interpolation of the daily freight flow and four major freight hotspots in the Los Angeles region. Freight activities are generally high on freeway networks and concentrated in the Long Beach and Los Angeles Downtown areas. Other locations with high freight activities include the City of Commerce and the City of Industry (Figure 2). These locations are regional centers of employment, characterized by a mix of warehousing and manufacturing industries.

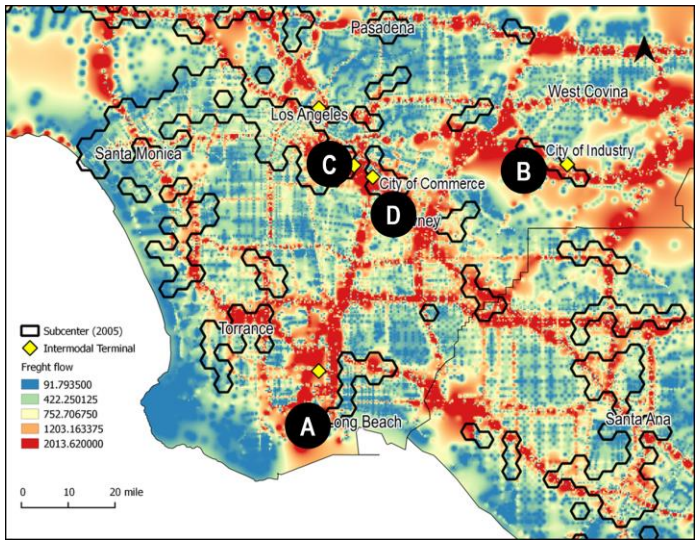

Figure 1

Figure 2

The modeling results indicate that employment is an important driver of freight activity. However, the two largest subcenters (one near downtown Los Angeles and another near Santa Ana) in the region have the opposite effect. This suggests that there is differentiation in the economic function and hence in the goods movement characteristics of different employment subcenters. Freight activities are high when being close to intermodal facilities, but the effect does not persist over longer distances, implying that freight activity is dispersed over transportation networks. This suggests that freight activities occur not only as a direct result of economic production and consumption, but also an indirect consequence of connecting different actors and players through existing transportation networks and distribution nodes.

Policy Implication

The findings imply that policy-makers should be more alert to the ways that the spatial distribution of employment shapes freight travel patterns. The policy focus should broaden beyond just intermodal facilities and highways to consider how land use development, including

the spatial pattern of employment and goods distribution centers, is associated with freight travel patterns.