



Caltrans Division of Research,
Innovation and System Information

Research



Results



Planning, Policy,
and Programming

Spatial Distribution of Economic Activities

Identifying the role transportation system level of service plays on economic development and business establishment success.

WHAT IS THE NEED?

The spatial distribution of economic activities has a profound impact on urban organization and development. Businesses provide services and jobs that influence where people choose to live, where people travel to purchase goods and services, and the revenues of local jurisdictions. The spatial distribution of existing business establishments also affects location decisions of other business establishments, through competition and agglomeration. Spatial differences in business location and human behavior impact the regional transportation network in the form of accessibility, traffic circulation, and congestion. In this context, integrated models of land-use and transportation are used to further analyze the impacts of these changes in regional planning and policy. Researchers and practitioners are developing increasingly disaggregate modeling of these integrated systems. In order to develop this type of model, we must understand the behavior of relevant market agents such as households, persons, business establishments, and land developers that make decisions regarding their locations as well as personal travel and the movement of goods and services. This project provided information about statewide planning modeling and simulation in the area of integrating land uses with travel behavior.

WHAT WAS OUR GOAL?

The key contribution of this research study was to thoroughly analyze the external (local context, transportation network) and internal (business type, reviews) factors that influence the success and failure of business establishments. Our goal was to conclusively identify the role transportation system level of service plays on economic development and business establishment survival and success.

MAY 2019

Project Title:

Spatial Distribution of Economic Activities

Task Number: 2851

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Caltrans provides a safe, sustainable,
integrated and efficient transportation
system to enhance California's
economy and livability.

WHAT DID WE DO?

This project was broken down into the following four key tasks:

- Task 1: In this task we assembled data from various sources, including the National Establishment Time Series dataset; Yelp/Google Places records of establishment locations, customer ratings, and specialties; transportation network; Caltrans Performance Measurement System traffic volumes, and US Census data. We then matched and verified recorded location identification information including geospatial coordinates, addresses, and business types. The first step was to purchase updated business establishment data to develop stable harvesting methods to extract data from Yelp and Google Places APIs (An application-program interface (API) is a set of instructions and standards for accessing a Web-based software application). We used widely available network data, as well as databases we have developed to create complete network datasets for multiple time points.
- Task 2: Using the data acquired in Task 1, we developed a comprehensive set of spatial metrics that include accessibility indicators, a summary level of service indicators at suitable geographic scales, relative location indicators, and grid-based density and diversity metrics. We computed these metrics at multiple scales, including very fine scale (150 m by 150 m grid cell) including census blocks and block groups, and with network travel distance buffers. Some of the methods used in this task were designed as part of other projects, and took additional time and effort to scale for the entire State of California.
- Task 3: We tested different statistical techniques to identify the best group of spatial metrics to use in the specification of probabilistic models for major business

establishment life cycle events. The events we focused on were: birth of a business establishment, dissolution (death of a business establishment), relocation out of California, relocation to another California county, and no change. We also studied establishments that move into California and pull factors for the move.

- Task 4: We identified the best fitting models that are consistent with economic theory, business practices, and empirical research, and reported on land use policies emerging from their inspection. We also analyzed and illustrated model sensitivity in terms of elasticities to level of service and other local variables.

WHAT WAS THE OUTCOME?

Although the objectives of this project were met and the factors impacting business establishment success and failure were identified using data from the entire State of California. However, in an attempt to better quantify the impact of transportation infrastructure and particularly transit forced us to focus one of the analyses on Southern California. Although this is a limitation that emerges from the focus on Southern California in our attempt to correlate level of service with business establishment events the findings are insightful supporting transit investments. This was done to make the analysis tractable and take advantage of detailed transit accessibility for that specific region. If other regions have similar indicators we could expand the analysis accordingly. A second limitation of the overall analysis is the lack of network-based centrality indicators statewide and for each year of the NETS business establishment inventory. This would have allowed a more direct correlation between business establishment events and central location measured using the infrastructure instead of the business density. Although it is feasible to

expand the analysis here using network-based centrality indicators, this type of work may be more appropriate for city-level analysis. A third limitation is due to our focus on four types of businesses and it may be worth testing the same models for all types of business establishments. Finally, it should be noted that we analyzed business establishment events and not firm evolution and correlation of events with business practices.

A key takeaway from this research is the benefit of local studies, particularly when detailed data can be made available for a particular region. The Los Angeles case study allowed us to investigate a wider range of variables in more detail than was possible for the statewide models, which are also informative in their own right. We recommend developing detailed local studies that examine business establishment histories and land parcel histories to build microsimulation of land use that is sensitive to the level of service and the relationship of co-locating businesses. Another takeaway from the relocation section is that businesses' preferences change over time. This is a limitation for any analysis of this sort, as predictive models based on past results will miss this change. In future work (and for planning now) it is important to consider what exactly "mixed use" means and what are the effects of this sort of development on the success of different types of businesses. This may again be more appropriate to be done with focus on a region instead of the State.

WHAT IS THE BENEFIT?

This research filled a gap in empirically supported knowledge linking the survival and economic success of business establishments to the performance of the transportation system that serves these establishments. We studied and documented this relationship for the entire State of California while controlling in a statistically

robust way for a variety of factors influencing business life cycle events, such as closures, formation/birth, and relocation. We drew lessons learned and developed suggested policies that increase economic development and business performance in order to boost the California's economic competitiveness. This project will also benefit future research by providing a better understanding of the types of the metrics and data sources that can be used to determine what areas and development policies are most conducive to business success.

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IMAGES

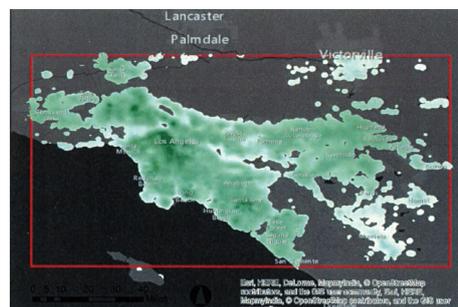


FIGURE 1: Southern California Retail Formation Suitability Map 2008

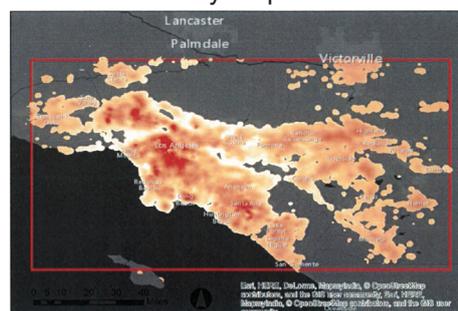


FIGURE 2: Southern California Retail Dissolution Likelihood Map 2008