



# Impacts of e-commerce on warehousing and distribution in California

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## Project Objective

The purpose of this research is to document and analyze trends in location patterns of warehousing and distribution (WD) activity in California over the past decade, and to explore the relationship between these trends and the growth of e-commerce.

## Problem Statement

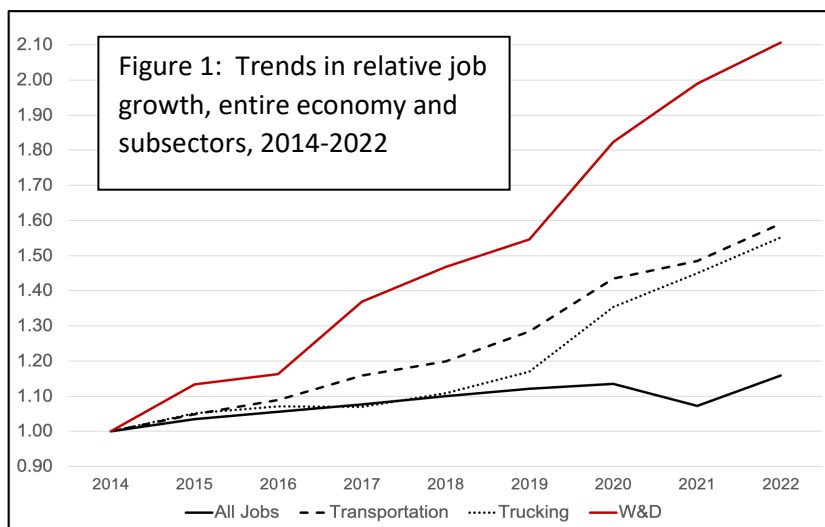
E-commerce has grown rapidly over the past two decades, with an average annual US growth rate of about 11% until the COVID pandemic, then increasing over 50% during the pandemic. After mid 2020 e-commerce sales continued to increase, but at a lower rate. With its emphasis on short delivery times and an ever-expanding array of products, new forms of supply chains have emerged which may have significant impacts on WD demand and location choice. On the one hand, scale economies in warehousing leads to demand for peripheral locations where land is cheaper and more available. On the other hand, short delivery times require access to the population. Therefore, impacts on the spatial distribution of W&D are unclear.

## Research Methodology

This research examines trends in WD location from 2014 through 2022 and has two parts. Part 1 is a descriptive analysis of WD trends. Part 2 estimates models to explain these trends. Our primary data sources are the County Business Patterns (CBP) and Zip Code Business Patterns (ZBP) data compiled by the US Census. Part 1 examines spatial trends at varying levels of aggregation, from state level to zip code tabulation areas (ZCTAs). Part 2 estimates a series of cross section and time series models to explain spatial and temporal trends.

## Results

Growth of WDs has far outpaced that of the general economy or the broader transportation sector as illustrated in Figure 1. The increases over the period are 15% for all employment, 60% for the transportation sector, and 111% for the WD sector. The vast majority of WDs are located in California's six largest metropolitan statistical areas (MSAs. Los Angeles-Orange, San Francisco-Oakland, Riverside-San Bernardino, San Diego, Sacramento, and San Jose), and the share of all WDs in these MSAs increased slightly to nearly 80%. Despite this enormous growth, the spatial distribution of WDs remained



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remarkably stable. One example is shown in Figure 2 for Southern California. Gains and losses are distributed throughout -- from the coastline to the Inland Empire. Another example is shown in Table 1, which shows that almost all ZCTAs that had at least one WD in 2014 also had at least one WD in 2022. Stability is also demonstrated by calculating the weighted average distance of all W&Ds to the CBD (Central Business District), identified as the zip code with the highest employment density in the MSA. None of the differences from 2014 to 2022 were statistically significant.

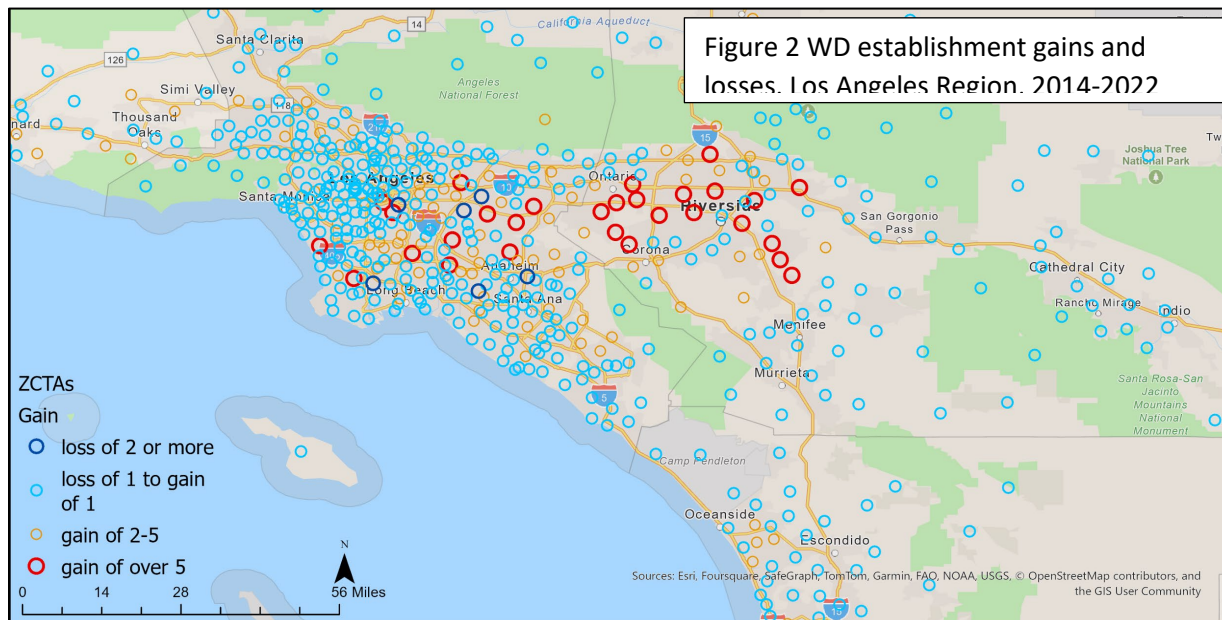


Table 1 ZCTAs with at least one WD 2014, 2022

	Yes WDs 2022	No WDs 2022	Total
Yes WDs 2014	27.2%	1.4%	28.6%
No WDs 2014	2.4%	69.0%	71.4%
Total	29.6%	70.4%	100%

Statistical models estimated the probability of a given zip code having at least one WD, and the probability of a given zip code having a given number of WDs as a function of local market conditions, regional market conditions, and transport access for the years 2014, 2019, and 2022 and intervals between these years. Models consistently showed local market conditions (labor force access, employment density) to be significant and regional market conditions (share of linked industries) not to be significant. The effect of transport access measures are mixed. In general access to airports is significant, but access to highways is not. However, 80% of all WDs are located within one mile of a highway. Model results are consistent with growth of WDs following the existing spatial pattern.

The decentralization or spillovers observed in the previous decade appears to have played out; few new WD clusters have emerged. This process of “infill” growth is consistent with e-commerce related demands for access to the population and short delivery times. It is also consistent with the increasing velocity of supply chains more generally. Spatial stability is further explained by the concentration of population and jobs in a few very large metropolitan areas, the role of the largest metropolitan areas in the national and international economies, and path dependence driven by infrastructure investments and historical growth patterns.