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Research Results

A National Study of Dockless Transportation: Land Use and Demographic Correlates of Trip Hotspots and Mode Shift

Build a statistical model that relates to dockless trip origins and destinations, for small geographic areas to land use characteristics.

Planning, Policy & Programming

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Project Title:
A National Study of Dockless Transportation: Land Use and Demographic Correlates of Trip

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Task Manager:
Kayo Lao
Assocaite Transportation Planner
kayo.lao@dot.ca.gov

WHAT WAS THE NEED?

This research built a land use regression model to explain dockless scooter trip generations. The research team used publicly available scooter trip generation data for Louisville, KY and Minneapolis, MN and publicly available data on land use characteristics. The model showed that scooter trip generations were associated with higher employment densities, higher densities of entertainment land uses (bars and clubs), and in some specification's higher densities of eating establishments and university buildings.

The researchers established that using the regression results to predict out of sample gave predictions that correspond well to observed scooter trip generations in Austin, TX. Because scooter trip data were not available for research in California, the team used the Minneapolis model to predict scooter trips as a function of land use characteristics in California census tracts. The results yielded a promising screening method that can highlight census tracts with land use characteristics that are potentially supportive of micromobility and non-automobile short-trip travel. They recommended that such a screening method could be a first step in more detailed analyses of planning programs or infrastructure that could support non-automobile short-trip travel.

WHAT WAS OUR GOAL?

Cities throughout the State of California face a challenge of deciding how to plan for and regulate micromobility travel – most notably, dockless scooter trips. As a new mode of travel provided by private operators, data on dockless scooter trip-making is private and limited, resulting in little being known about what influences dockless scooter tip generation. The goal

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of this research was to bridge this understanding by building a land use model of dockless scooter use from publicly available data in two cities, Louisville, KY and Minneapolis, MN and then applying the model to the State of California to identify areas with high potential for dockless scooter trip generation therein.

WHAT DID WE DO?

This research is most similar to Bai et al. (2020) in that the model scooter trip generations as a function of land use characteristics, as did Bai et al. (2020). The research team extended the literature in three ways. Firstly, they used measures that proxy destinations, including employment densities and densities of business establishments by type of business, that gave a more granular view of land use, particularly of possible destinations, compared with the analysis in Bai et al. (2020).

Secondly, they included only variables that can be obtained for any city in the U.S. in the land use model. The objective was, in part, to examine how land use data that are available most anywhere explains dockless scooter trip-making. While previous studies have at times focused on the particularities of a location (for example, McKenzie, 2019 notes the importance of the National Mall in Washington, D.C. for scooter trip generation), the research team focused on how variables that were available anywhere that were associated with dockless scooter trip-making.

Their reason for doing this relates to the third objective. Only a limited number of locations publicly report data on dockless scooter trip-making. The third objective was to examine how well a scooter trip generation model, fit on data outside of California, can illuminate the potential for dockless scooter travel within California. Clearly, such an exercise required general rather than specific data. In the current environment, in which dockless scooter trip data would likely not be publicly available in many locations, understanding the potential insights from models fit out-of-sample (and hence outside of a location) were important, and was as yet completely unstudied to our knowledge.

WHAT WAS THE OUTCOME?

The descriptive statistics and model results support much of the researchers' observations and are consistent with expectations about dockless scooter travel. Specifically, they found that dockless scooter trips were heavily concentrated in select areas, and that these areas are characterized by heightened employment and activity center establishment densities.

The land use model resulted for the Cities of Louisville and Minneapolis, respectively showed employment density had a statistically significant and positive relationship with dockless scooter trip generation. In both of the trips per day model and trips per day model with date fixed effects model, there were around five additional dockless scooter trips taken per day in Louisville for every 1,000 jobs per square kilometer. In Minneapolis, the corresponding value was approximately four.

However, in the average daily trips model, the influence of employment density is about one-tenth the magnitude as in the other models. The findings were similar for the relationship between bar/nightclub/pub density and trip generation, which was positive and statistically significant in both the trips per day model and the trips per day model with date fixed effects.

WHAT IS THE BENEFIT?

Overall, the researchers found that the land use determinants of dockless scooter trip generation conform well to intuition and theory and were largely stable across regression specifications.

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Going forward, they suggested that combining results of this research with local knowledge about specific locations could help identify places where supportive infrastructure and policy could encourage shifts of short trips from automobile to non-automobile and micromobility modes. Their descriptive statistics and model results supported much of the observations and were consistent with expectations about dockless scooter travel.

This table summarizes the descriptive statistics of the dataset.

	Louisville, KY				Minneapolis, MN			
Variable	Min	Mean	Max	Standard Dev	Min	Mean	Max	Standard Dev
Tripcount (trips per day per block group)	0	1.63	2,085	22.7	0	8.16	1209	43.02
jobdensity	0.92	661.37	27,272.1	1860.57	3.08	1954.9	89,026.02	6,389.68
popdensity	0	927.01	5,153.47	725.65	0	2,143.13	44,608.3	3,089.63
density_food	0	0.89	12.09	1.77	0	2.91	23.02	4.41
density_barclub	0	0.15	7.8	0.69	0	0.66	21.31	2.08
density_school	0	0.48	10.12	1	0	0.64	8.59	1.44
density_university	0	0.05	3.45	0.32	0	0.11	7.76	0.75
density_place_of_worship	0	0.88	10.12	1.29	0	1.18	8.21	1.94
downtowndistance (in meters)	334.62	11,792.67	29,152.7	6,125.54	166.46	5,120.69	11,242.94	2,354.13
Date Range	August 9, 2018 to January 31, 2020				July 10, 2018 to November 30, 2018, May 13, 2019 to November 26, 2019			
Total Trips Taken	503,106				1,143,016			

LEARN MORE

https://www.metrans.org/research/a-national-study-of-dockless-transportation-land-use-and-demographic-correlates-of-trip-hotspots-and-mode-shift

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