Scoot over! Study reveals E-scooter use in Washington D.C.

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Electric scooters or 'e-scooters' are taking over cities worldwide and have broad appeal with tourists. Although e-scooter use declined during the COVID-19 pandemic, its popularity could rebound rapidly, especially if travelers start to substitute scooters for transit on some shorter trips. Shared e-scooters in particular, are a rapidly emerging

mode of transportation, but present a host of regulatory challenges from equitable distribution to parking infrastructure to pedestrian safety, among others.

Understanding travel demand patterns of shared e-scooter use and the demographics most likely to use this alternative form of transportation are expected to be a moving target for several years and a challenge for city, regional and transportation planners. Several other researchers have investigated spatial patterns of e-scooter demand, but they have had inconclusive or contradictory findings and have examined large zones rather than specific street segments.

This shortfall is what led a researcher from Florida Atlantic University's Charles E. Schmidt College of Science and collaborators from the University of Florida to try to figure out what drives spatial patterns of e-scooter use. Their solution? They have built the first segment-level model that allows for capturing built environment variables more precisely. Also, they identify and account for likely destinations for scooter users such as transit stops, commercial areas and parks.

For the study, published in the journal Transportation Research Part A, researchers analyzed Washington, D.C. because of its availability of wide-open data, including built environment data and the maturity of its shared mobility market. Washington D.C. has been a leader in micro-mobility since the launch of its bikeshare program in 2008. The city started permitting dockless bikeshare in 2017 and soon after started an electric shared scooter pilot in 2018.

Results of the study provide a clear picture of trip generation and trip attraction sources for shared e-scooter trips in Washington D.C. And it turns out that both built environment and demographic factors matter. Tourism appears to be a considerable driver in scooter use; tourist attractions, hotels and metro stops are all predictive of higher

destinations, with a larger effect on Saturdays than on weekdays. The areas of predicted high scooter traffic are almost all in the downtown area, near the Mall, the White House and Congress. Hotels, streetcar stops and circulator stops all approximately double the number of expected scooter destinations, with the number of bus stops having a smaller effect.

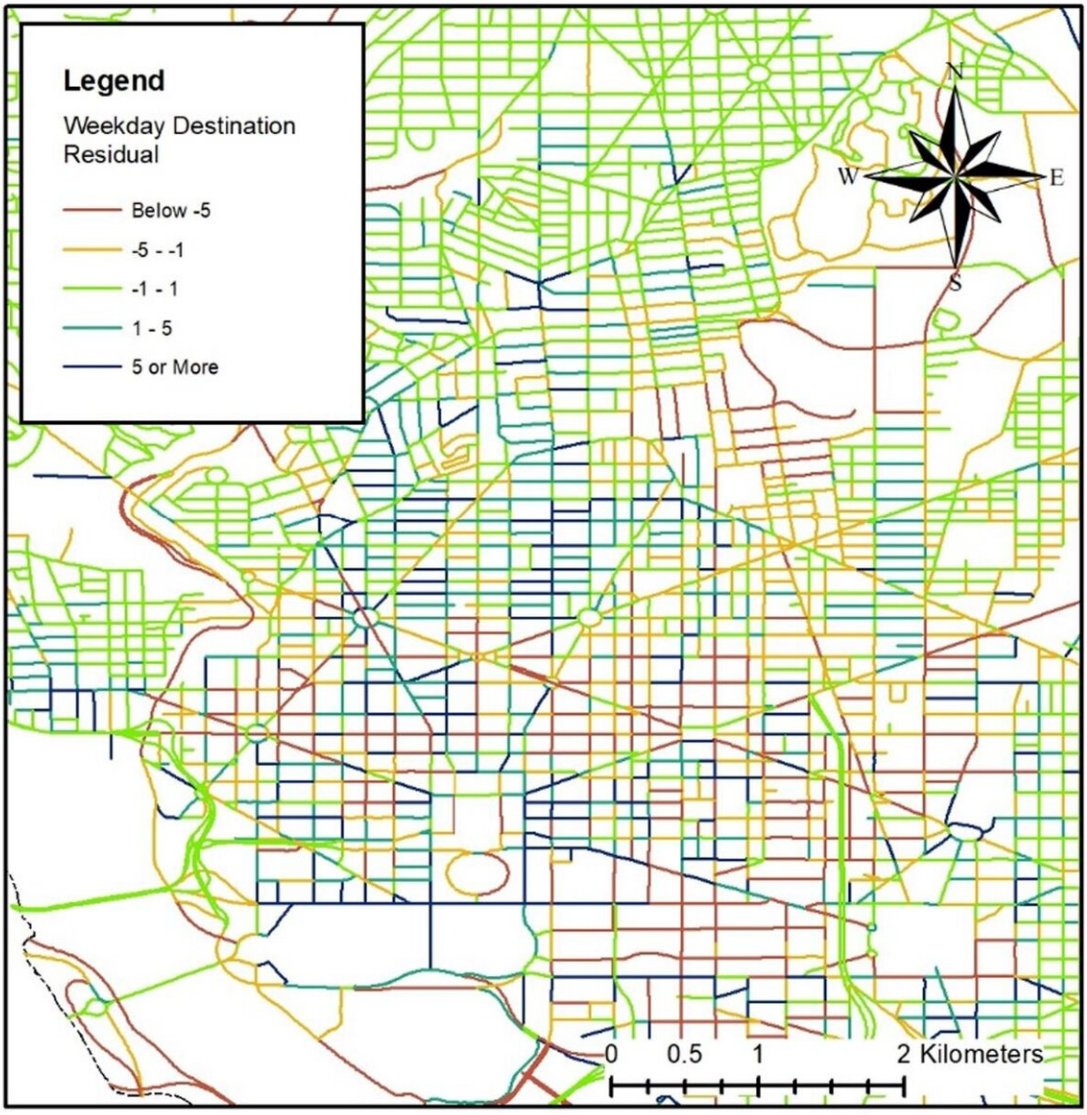

Fig. 3. Residuals by Segment for Weekday Destinations, Downtown Area.

Researchers analyzed Washington, D.C. because of its availability of wide-open data, including built environment data and the maturity of its shared mobility market. Credit: Florida Atlantic University

Researchers also discovered, after controlling for other types of destinations, public transit stops of all kinds—metro stops, bus stops, circulator stops and streetcar stops—are predictive of scooter destinations. For the demographic variables, younger median age, percentage of bachelor's degrees and population density, each were positive predictors of both trip origins and trip destinations. Trip origins and destinations are highly centralized in Washington D.C. and anchored to the scooters' start-of-day locations.

"Unlike destinations, trip origins are primarily predicted by the supply of scooters available on a given segment over the course of a day," said Louis A. Merlin, Ph.D., lead author and an assistant professor, Department of Urban and Regional Planning in FAU's Charles E. Schmidt College of Science. "Our model has the ability to identify segments with high levels of expected scooter demand, correctly identifying 56 to 60 percent of segments in the top 5 percent of usage in trip destinations. Therefore, transportation planners can use this model or similar ones customized for their city to identify street segments with a high demand for scooter parking. Such models can also predict areas of redevelopment that will likely need the provision of scooter parking."

Findings showed that built environment variables also had a statistically significant relationship with trip origins—commercial square feet and condo square feet are positively correlated. In contrast, residential floor space, parks, and national parks are negatively correlated. However, all of these effects are smaller than in the corresponding trip destinations models.

"We believe the evidence is more persuasive that riders are using scooters for transit access and egress. By leveraging a derived-demand framework, we have attempted to control for the most common types of origins and destinations for scooter travel—residences, commercial areas, tourist stops, parks, and hotels," said Merlin. "The fact that transit stops are still significant after controlling for these other destination types suggests that the stops themselves are likely an attractor for scooter trip destinations."

For the study, researchers used four weeks of data between June 17 and July 14, 2019, and selected this period because it represents the month of highest use. From this period, they selected data for four weeks of weekdays, Monday to Thursday, for a total of 16 weekdays and four Saturdays. The data standard that scooter companies use is called General Bikeshare Feed Specification (GBFS). GBFS data attributes include scooter ID, latitude and longitude of scooter location, and battery level. To protect users' privacy, only the data of "free vehicles" (scooters not in use) is available.

More information: Louis A. Merlin et al, A segment-level model of shared, electric scooter origins and destinations, *Transportation Research Part D: Transport and Environment* (2021). DOI: 10.1016/j.trd.2021.102709

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