Shared e-scooter service providers with large fleet size have a competitive advantage: Findings from e-scooter demand and supply analysis of Nashville, Tennessee

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Background

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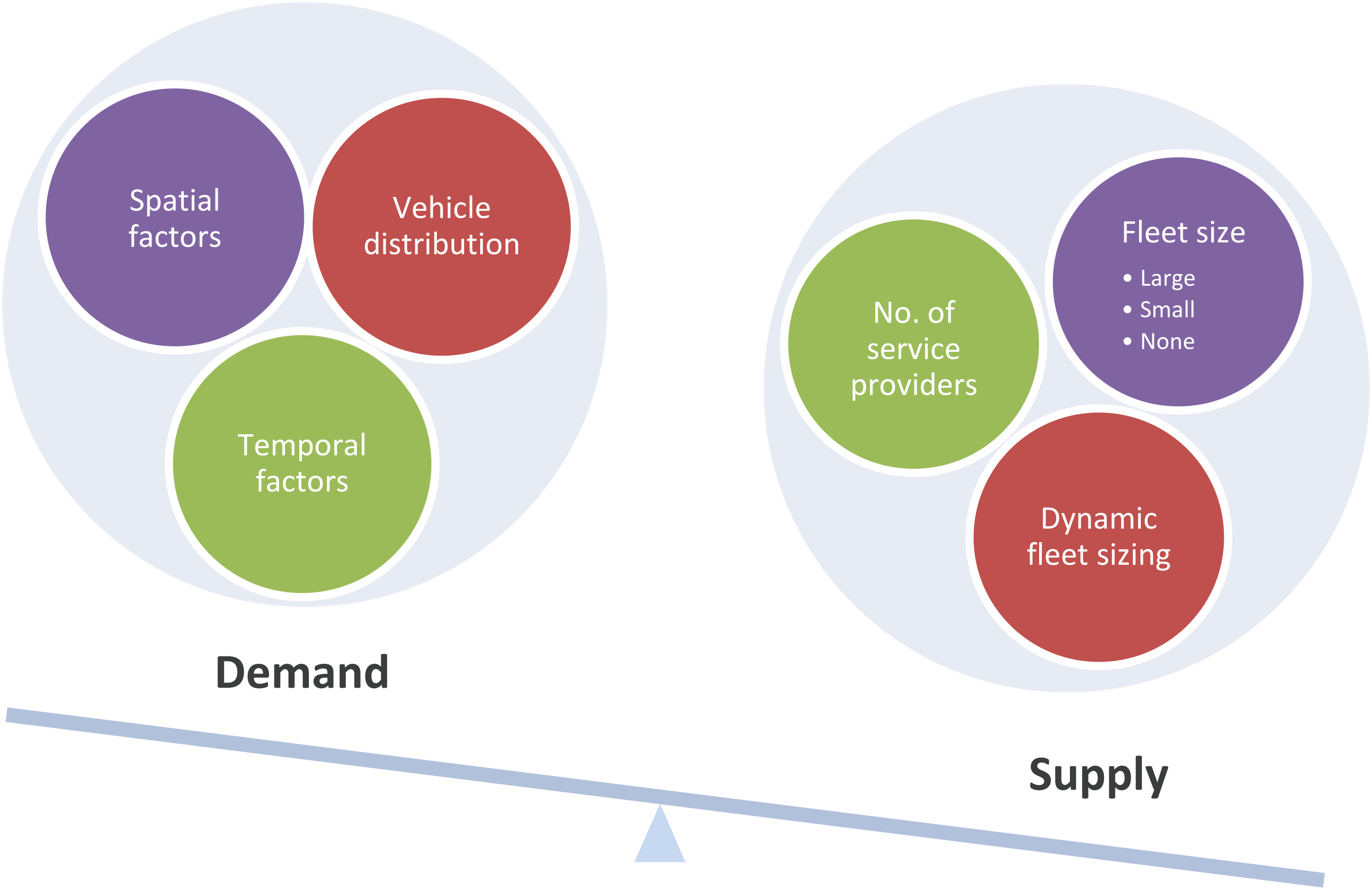


Objective: To estimate the demand elasticity of deployed e-scooter vehicles by comparing actual demand (e-scooter usage) with supply dimensions (vehicles deployed).

Research objectives and methods

Research objectives

1. Estimate the demand elasticity of total e-scooters deployed (measured as e-scooter hours deployed)
2. Estimate the demand elasticity of e-scooter vehicles deployed specific to land use type

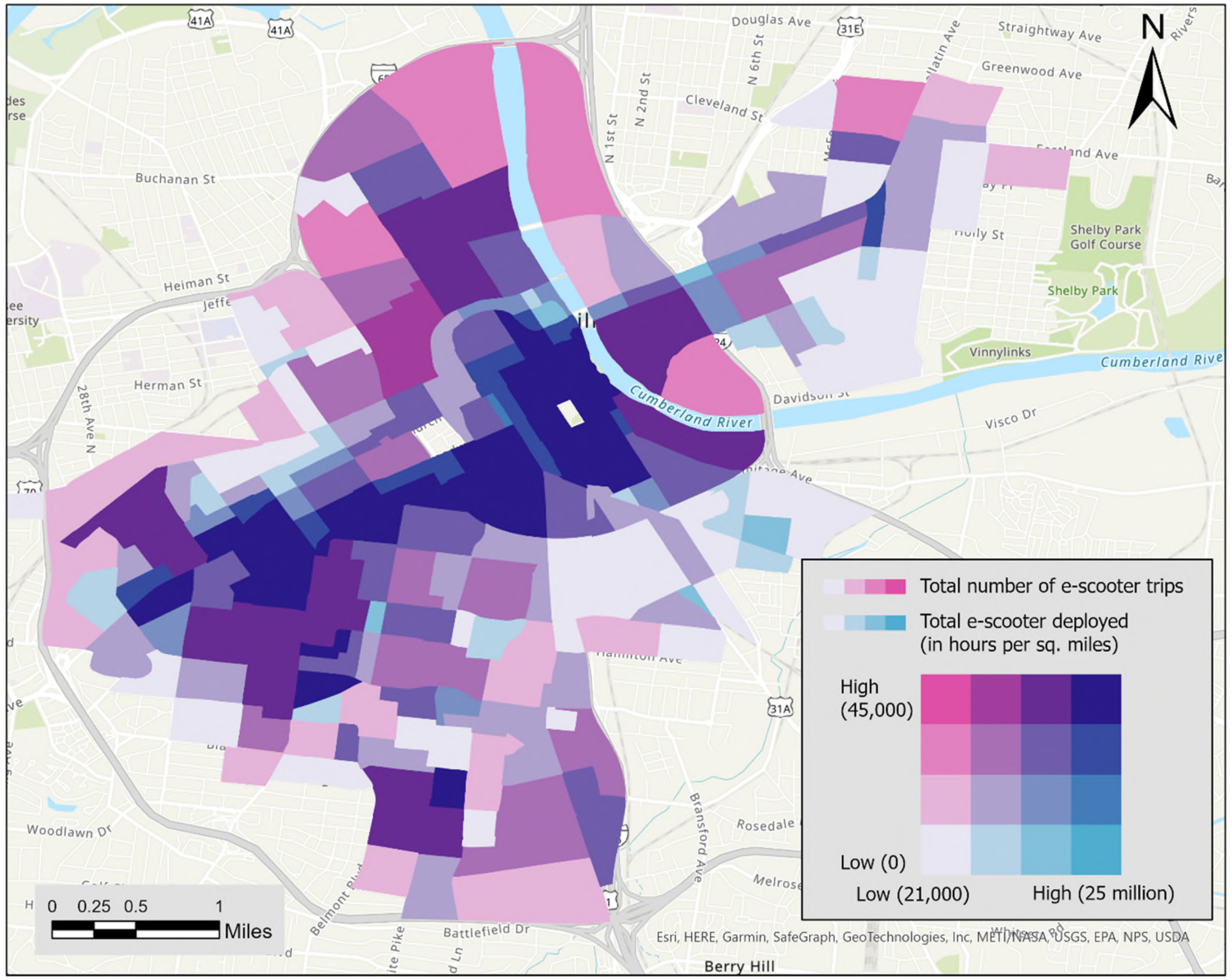
Study location: Nashville, Tennessee

Study time period: April 2019 to February 2020

Data Source: Shared Urban Mobility Device (SUMD) dataset from seven service providers

Method: Negative binomial fixed effect regression and K-means clustering to identify land use types

E-scooter deployment versus trips

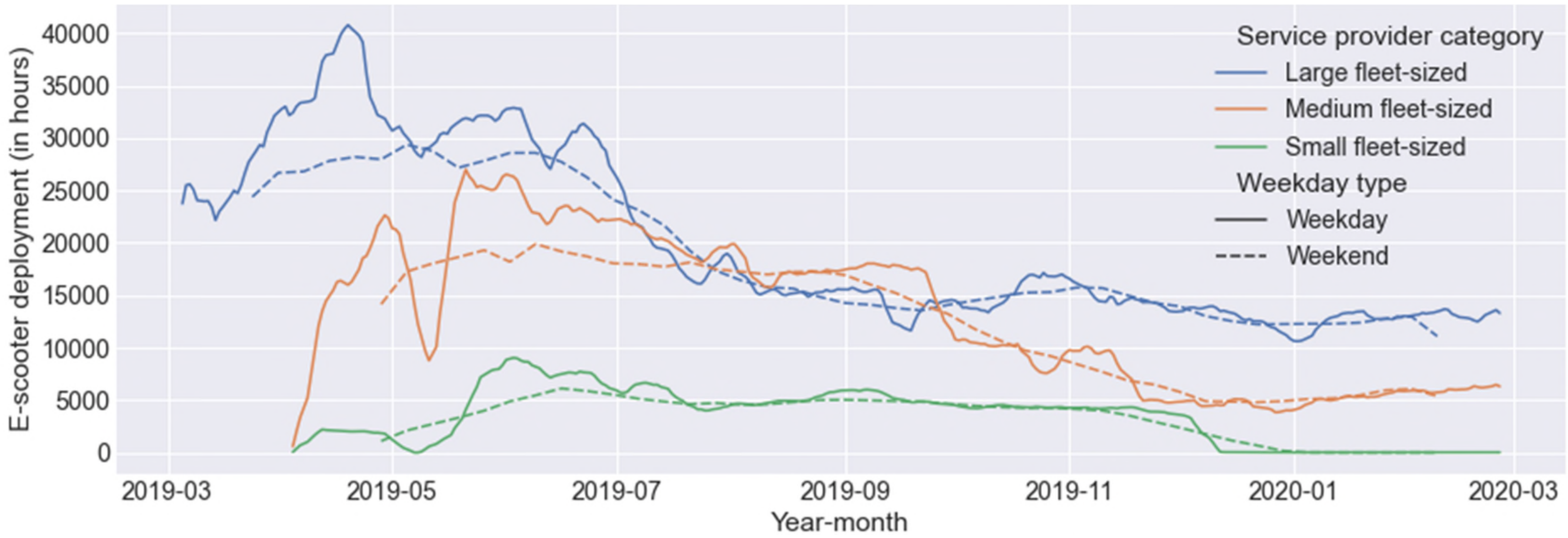


Total e-scooter trips and vehicles deployed aggregated at the TAZ level

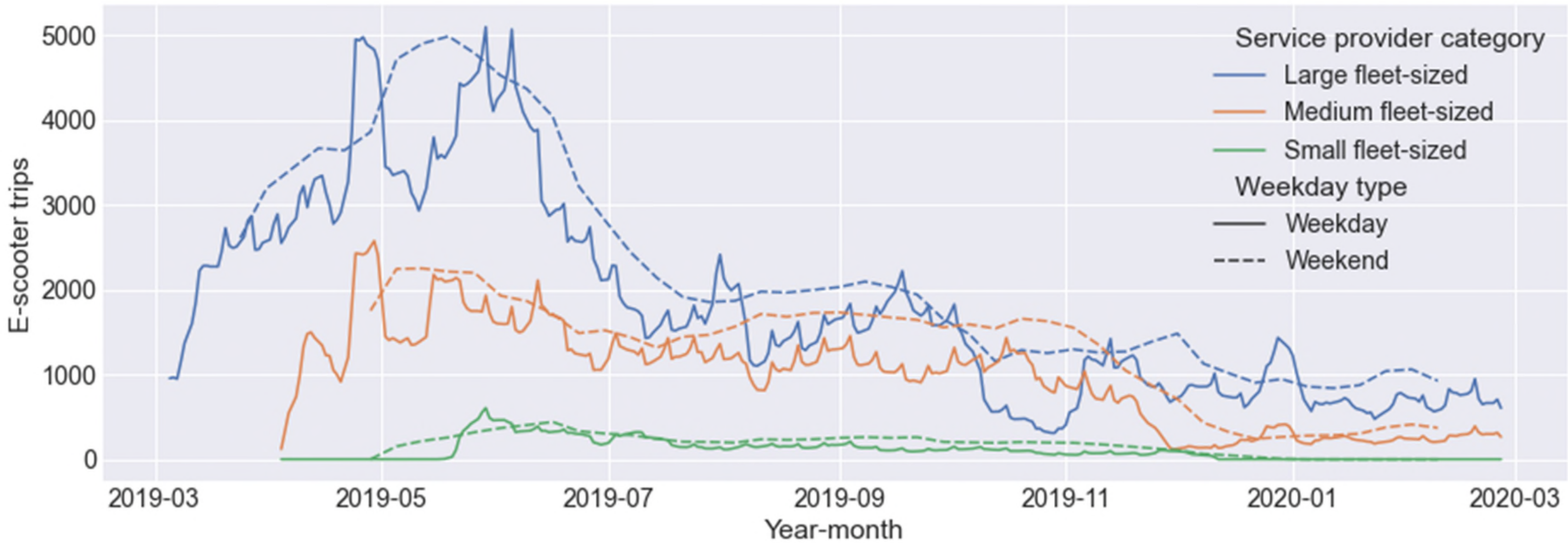
Most e-scooter trips and vehicle deployments were in the following locations:

- Downtown Nashville
- Vanderbilt University
- Commercial areas in the periphery of downtown Nashville

E-scooter deployment versus trips (cont.)



Daily e-scooters deployed (supply aspect)



Daily trips (demand aspect)

We categorized e-scooter service providers into three groups:

- Large (>500 e-scooters or >12,000 e-scooter-hours)
- Medium (250-500 e-scooters or 6,000-12,000 e-scooter hours)
- Small (<250 e-scooters or <6,000 e-scooter hours)

E-scooter trips and vehicle deployment are higher during warmer months (April-July)

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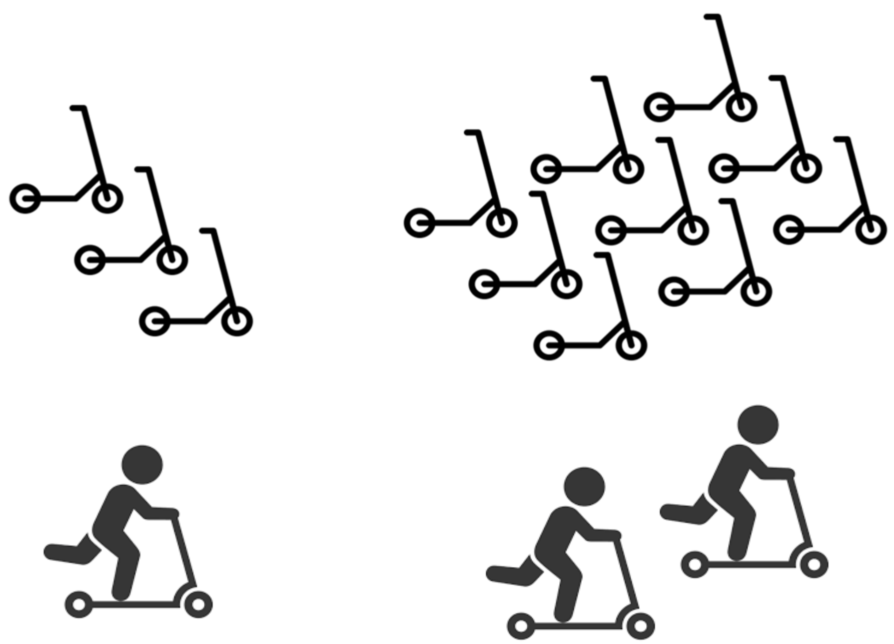
Total demand elasticity

E-scooters deployed



Inelastic (0.55)

Weekdays (0.55) **<** Weekends (0.59)

E-scooters deployed by service provider size

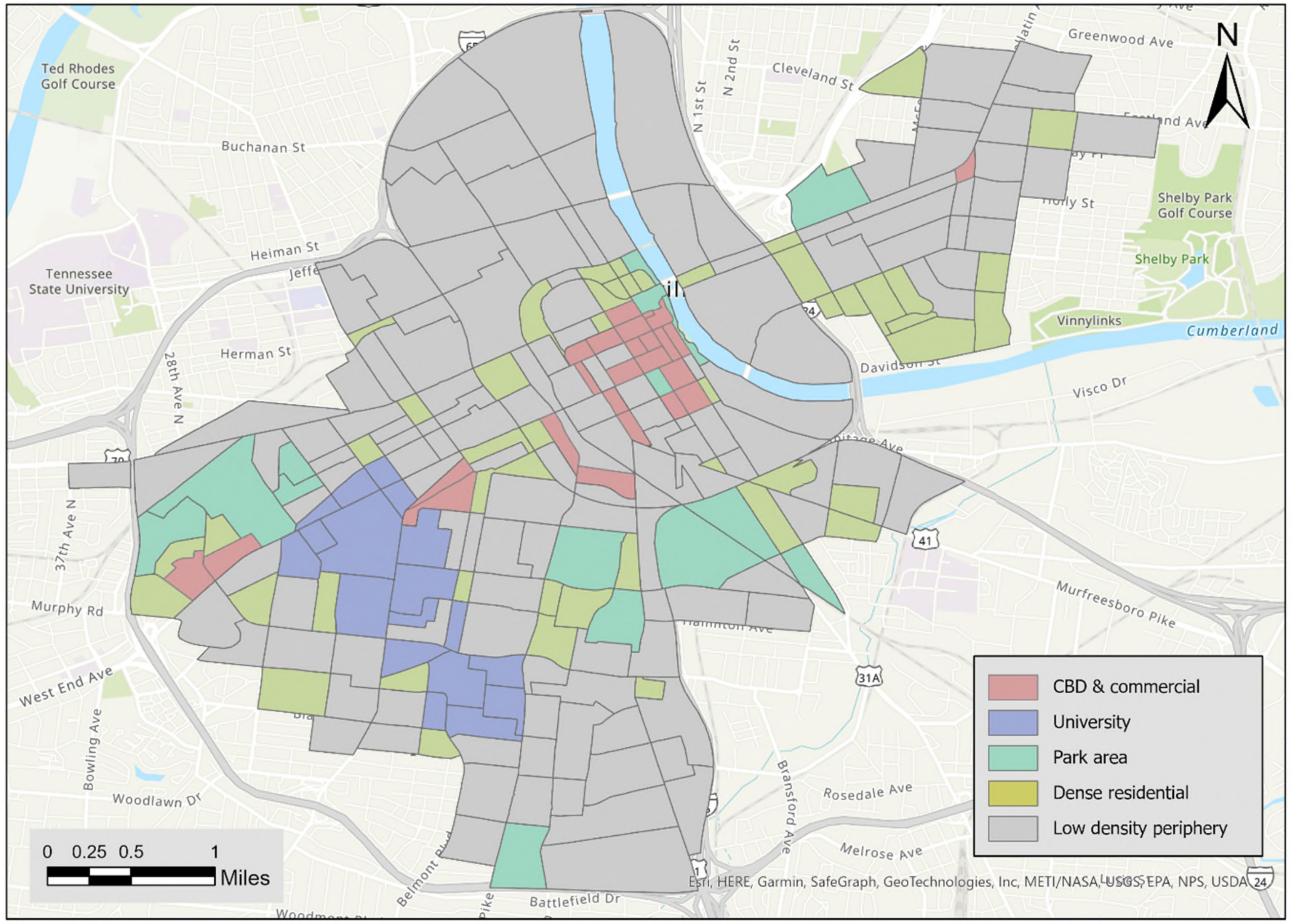
Large-sized service provider (0.36) = **2.8** × Mid-sized service provider (0.14)

Large-sized service provider (0.36) = **36** × Small-sized service provider (0.01)

Land use

Five clusters from K-means algorithm as follows:

1. Central Business District (CBD) & Commercial
2. University
3. Park & waterfront
4. Dense residence
5. Low density periphery



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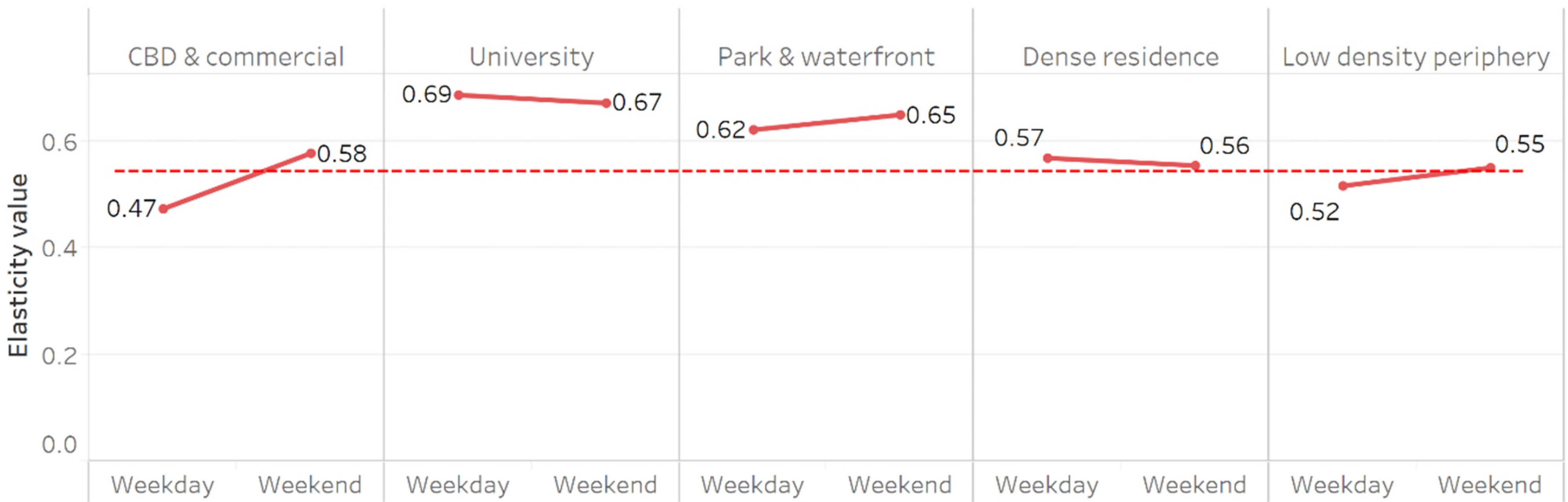
Land use-specific estimation

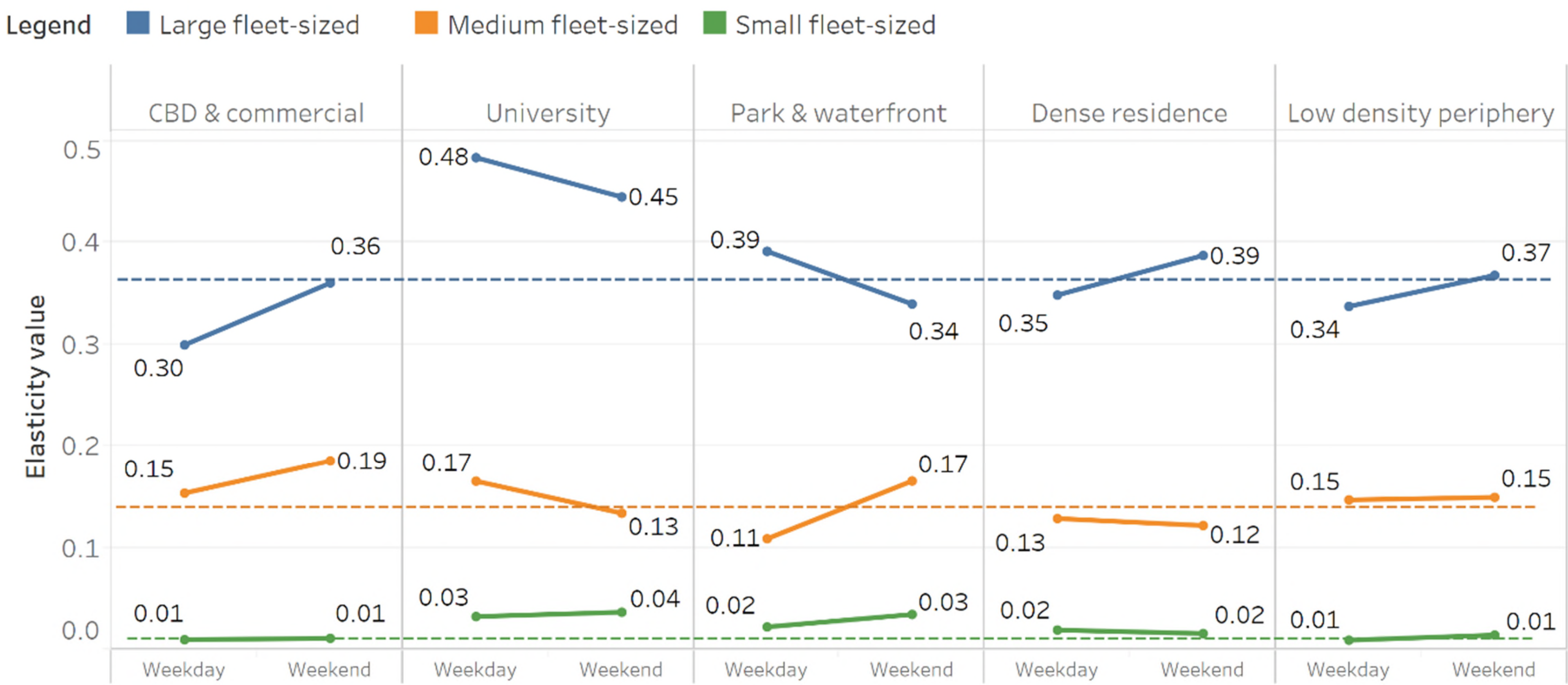


Elasticity estimates of the total vehicles deployed per land use type

“University” land use type has a maximum difference between average demand elasticity and land use-specific estimate

Implication: Increasing e-scooter vehicle deployment at “university” land use type would increase trips at a higher rate than in other built environments

Land use-specific estimation (cont.)



Elasticity estimates of the vehicles deployed by service providers segmented based on fleet size

- Large fleet-sized service providers likely influence the overall difference in average demand elasticity of e-scooter vehicles
- There is a difference in weekend and weekday estimates for each land use type and service provider category

Conclusion

- Deploying more e-scooters does not proportionally increase the number of trips taken, but large service providers have a competitive advantage
- We recommend the following to city governments:
  - Permit a few shared e-scooter service providers with large fleet sizes
  - Consider dynamic fleet sizing on weekdays and weekends to manage the public space

Questions?

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