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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TSITE Summer Meeting
July 2022
**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

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

Study location: Nashville, Tennessee
Study time period: April 2019 to February 2020
E-scooter deployment versus trips

Most e-scooter trips and vehicle deployments were in the following locations:
- Downtown Nashville
- Vanderbilt University
- Commercial areas in the periphery of downtown Nashville

Total e-scooter trips and vehicles deployed aggregated at the TAZ level
E-scooter deployment versus trips (cont.)

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)
Total demand elasticity

E-scooters deployed

Inelastic (0.55)
Weekdays (0.55) < Weekends (0.59)

E-scooters deployed by service provider size

<table>
<thead>
<tr>
<th>Service Provider Size</th>
<th>Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large-sized service provider</td>
<td>2.8</td>
</tr>
<tr>
<td>Mid-sized service provider</td>
<td>0.14</td>
</tr>
<tr>
<td>Small-sized service provider</td>
<td>36</td>
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<tr>
<td>(0.36)</td>
<td></td>
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<tr>
<td>(0.01)</td>
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</tbody>
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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
Land use-specific estimation

“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.)

- 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

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