Building Charging Stations to Foster Electric Vehicle Demand

Ajmain Hossain, Cabir Kansupada, Neel Shroff
Range anxiety hinders electric vehicle (EV) sales.

- EVs only make up <1% of the global vehicle fleet despite their environmental benefits — largely due to range anxiety.*

- Public charging stations mitigate range anxiety.

Central Question:
Does local public charging availability increase demand for EVs, and if so, where can new charging infrastructure be built to intentionally foster demand?

* International Energy Agency, 2020
## Two-Part Analysis

<table>
<thead>
<tr>
<th>Question</th>
<th>Data &amp; Source</th>
<th>Data Science Method</th>
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</thead>
</table>
| Part 1: Does local public charging availability increase demand for EVs? | - New-build charging station time-series *(Federal Gov.)*  
- Washington EV Registration Activity *(State Gov.)* | T-test, Diff-in-Diff Test                                                   |
| Part 2: If so, where can new charging infrastructure be built to intentionally foster demand? | - Income Data *(IRS)*  
- Educational Attainment *(Census)*  
- Population Data *(State Gov.)* | Regression Prediction                                                       |
New charging stations increase EV demand.

**Key Takeaway**

Building a zip code’s first charging station has a statistically significant, positive effect on EV demand.
Charging stations could be more effective in some zip codes than others.

- Using linear regression, we can predict how many EVs *should* be in each zip code based on its demographic data (income, education, population).
- The difference between the predicted and actual EV population shows where charging stations are most needed.

### Top 5 eligible zip codes in Washington State:

<table>
<thead>
<tr>
<th>state</th>
<th>zip</th>
<th>POP2020</th>
<th>avg_agi</th>
<th>perc_bach_plus</th>
<th>sum_vehicles</th>
<th>sum_charging_stations</th>
<th>diff</th>
<th>profit_potential</th>
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<tbody>
<tr>
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<td>99301</td>
<td>85,131.44</td>
<td>61.43</td>
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</table>

**Total: $29.2 M**
Stations likely generate enough demand to justify their cost.

**Average Station Cost**: $123,000

**Average profit per EV**: $54,500 ASP * 20.6% EBITDA margin = $11,200

**Required Demand Generation per Station** = Station Cost / Profit per EV  
= ~11 EVs/Station

*Is this believable?*

**Recall**: Regression coefficient in Diff-in-Diff = 0.47  
So, 11/0.47 = roughly 23 months to generate enough demand

* International Council on Clear Transportation, 2019  
** Tesla Q3 2020 Shareholder Letter*