Is Electric Mobility a Means for more Sustainability? Observations on the Mobility and Charging Behavior from an On-Road Test with Electric Scooters

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Research Question
Electric Vehicles (EV) can be a contributor to reduce Greenhouse Gas Emissions, if …
… EVs reduce the use of conventional vehicles and do not replace sustainable ways of transportation (e. g. public transportation)
… EVs are charged with electricity from renewable resources (RES)

It is, however, challenging to investigate these aspects, because…
… no observable sample → only few German household own an EV
… no incentives in place that motivate to shift charging at times when RES-electricity is available

Study Set-Up

Two tests: April – July 2012 (A) and 2013 (B)
- Each sample with 10 business-engineering students
- Tracking & analysis in two phases: conventional (1) and electric (2) mobility behavior
- Additional data from a pre-post-questionnaire
- Focus groups on smart charging strategies (4 online and 1 face-to-face group)

Results: Mobility Behavior

- Main trip purposes: leisure (53 %), university (22 %)
- Main means of transportation: bicycle (43 %)
- Total number of trips increased in Phase B with e-scooters available
- E-scooters are used for short distances (~ 4 km) and mainly replace bicycles, public transportation, and walking

Results: Charging Behavior

- Main charging strategy: only when necessary (9 % prior to trips)
- Charging mainly took place at evening/night-times
- High load-shifting potential (i.e. time difference between the car being plugged-in and charging)

Electricity prices played no role in the field-operational-test
- Decisive factor for charging: need (battery status), organizational effort when no public infrastructure available
- Willingness to shift charging depends on
  - Charging costs and saving potentials
  - Smart charging solutions for more convenience

Willingness to shift charging in different scenarios