Increasing Electrical Vehicle Adoption with personalized nudging

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Overview

The adoption of electric vehicles (EV) is an essential step for curbing transportation-related CO2 emissions which are mainly caused by road vehicles (Tong et al, 2019), reduce local air pollution and to achieve climate objectives and more sustainable transport in line with the United Nations Development Goals and the Paris Agreement. While many countries implemented financial incentives, better-charging infrastructure availability, and adapted traffic regulations, the global share of electric vehicles is still low (current projection of 20% share in 2030) compared to its mass-market objective of 60% share needed in 2030 to align with zero CO2 emissions by 2050 (IEA, 2022). Many consumers still lack knowledge and are skeptical about EV adoption (Needell et al., 2022; Li et al., 2017; Singh, Singh & Vaibhav, 2020), and behavioral interventions may complement current financial and technological incentives to increase EV adoption.

This project measures the effectiveness of a series of non-monetary treatments informed by recent studies in economics and behavioral science that aim to increase the adoption of EVs among owners of internal combustion engine vehicles. To do so, we identified and tested a series of treatments that are targeted at different behavioral or informational barriers/misperceptions preventing the adoption of electric vehicles. More precisely, we tested how information on range anxiety, charging anxiety, fuel cost savings, environmental impact (CO2 emissions), social norms, and physical characteristics of electric vehicles (addressing energy level and showing energy label, home-charging, number of charging stations) impact preferences for electric vehicles.

In a follow-up study, we focus on the three most promising treatments addressing range anxiety, charging anxiety and total cost of ownership of electric vehicles and how they impact willingness to pay for EVs when compared to a similar combustion engine vehicle and the likelihood of switching to an EV. Here, we provide feedback on perceived and actual compatibility of EVs with respondents stated behaviour to provide empirical evidence on the effectiveness of tailored communication treatments (so-called personalized nudging based on participants' misperceptions) on EV adoption.

Methods

We carried out a first experiment in which subjects who own a car (EV or internal combustion engine) and live in Switzerland or Germany (N=96, age:19-68 y.o., 39 females) performed 1) a rating task in which they had to indicate which information on EV benefits they found more convincing, 2) a choice task in which they had to state the preference between two information treatments with information on EV benefits, 3) a ranking task of information treatments, 4) a survey on car ownership, car preferences, and car attributes, and 5) a demographics survey. Furthermore, based on initial findings, we are currently conducting a follow-up study with UK car owners (N=3000) that will be finished by the time of the IAEE conference. In detail, in an online survey environment, we will identify the perception of range anxiety, charging anxiety and total cost of ownership. In a second part of the survey we will collect information on actual behavior. In the third part of the survey, feedback is provided on mismatches between perceived and actual compatibility of EVs with long distance driving (range anxiety), everyday parking behaviour and the availability of charging stations (charging anxiety) and perceived and real total cost of ownership. Each participant will be presented with the non-monetary treatment where we find the highest deviation between perceived and actual compatibility.

Results

In the first experiment, we found that across two different rating tasks, the most efficient treatments were information treatments highlighting cost savings and addressing range anxiety. On the other side, the least efficient/convincing information treatments addressed electricity consumption, energy level, and social norms. Moreover, participants had very little knowledge of electrical vehicle characteristics and frequently had wrong beliefs about information related to electrical vehicle characteristics. In more detail, they underestimate the range of the electrical vehicles and overestimate the cost of public fast and home charging. Looking at the rated reasons for buying an electric vehicle, the most important are climate factors, reduced CO2 emissions, thinking of future generations, and positive testimonials by existing electrical car owners. First results of the follow-up study show a strong level of misperception on range anxiety.

Conclusions

Taken together, our results will shed light on the extent of 1) misperceptions on EV compatibility, 2) the effectiveness of non-monetary treatments and 3) personalized nudging for electrical vehicle adoption. Existing results from the first two experiments provide evidence for the overall low knowledge and common misperceptions of electrical vehicle characteristics, as well as which are the features current car owners believe, are the most important to switch to electric vehicles. The planned follow-up study will extend these preliminary results and provide a deeper understanding of what are the largest misperceptions/knowledge barriers for UK car owners. Moreover, the implementation of a 2D video personalized nudging will not only increase the ecological validity but will also provide evidence of whether personalized nudging increases electrical vehicle adoption in a choice experiment with stated preferences. Such evidence will provide a profound knowledge of how efficient targeted non-monetary interventions are to guide consumers toward the adoption of electric vehicles. Such scalable interventions could be used by two main groups of stakeholders: car retailers who could adjust their sales activities and communications about environmental and economic benefits to their customers. And on the other side, policy makers could use such information for complementing the classical policy approach in order to achieve global electrification of mobility.

References

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