Publication

Empirical Analysis of Mobility Behavior in the Presence of Pigovian Transport Pricing

Other Publications (Forschungsberichte o. ä.)

ID 4635732
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Year 2021
Title Empirical Analysis of Mobility Behavior in the Presence of Pigovian Transport Pricing
Pages 243
Publisher Bundesamt für Strassen (ASTRA), Eidgenössisches Departement für Umwelt, Verkehr, Energie und Kommunikation (UVEK)
Keywords Transport pricing, external costs, Pigovian pricing, congestion, climate change, RCT
This study investigates and analyzes the effect of Pigovian transport pricing in Switzerland, i.e., personalized pricing of all external costs in transport. The project's core is a virtual transport pricing based on the observed transport behavior of the participants in the experiment. The empirical work of the project was conducted by ETH Zurich, University of Basel, and ZHAW from September 2019 to January 2020. The project was funded by the Swiss Competence Center for Energy Research (SCCER CREST-Mobility Joint Activity), the Swiss Federal Roads Office, and the Swiss Federal Office of Transport. Pigovian transport pricing is a nearly 100-year-old idea (Pigou, 1920; Vickrey, 1963) to reduce the external costs of transport to an economy-wide optimum. External costs are all societal burdens that the users themselves do not bear. Ideally, transport pricing takes into account all external costs: emissions of pollutants, noise and greenhouse gases, safety risks and health effects, lack of seats in public transport, and congestion on the roads, but also the operating and maintenance costs for the transport infrastructure. Implementing the idea was technologically impractical for a long time, but this hurdle has fallen due to digitization in recent years. Partial implementations of transport pricing are increasing worldwide, e.g. as congestion pricing in Singapore, London, Stockholm, or as road pricing on German or French highways. In Switzerland, only surveys and modeling studies have been conducted so far (Vrtic et al., 2010; INFRAS, 2019). The MOBIS study went one step further and tested the impact of Pigovian transport pricing in an experiment with 3,700 participants in metropolitan areas in the French and German-speaking parts of Switzerland. It is the largest and most comprehensive transport pricing experiment in the transport sector to date and allows the robust estimation of the effect size for the agglomeration areas in Switzerland. After the four-week observation period, the information group received regular information about the amount of external costs their behavior had caused. These external costs were converted to money and presented, but participants did not pay for these costs. The pricing group received the same information for the second phase of the experiment and a budget from which the external costs were deducted. This personalized budget was slightly more than each participant's actual external costs during the first four weeks of the study. As an incentive to reduce the external costs of their transportation behavior, this group was allowed to keep the unspent portion of the budget. In this sense, Pigovian transport pricing was implemented for this group. The core result of the study is the significant reduction in external costs observed for participants in the pricing group. These participants measurably changed their behavior through shifts in route choice, departure time choice, and mode choice. In particular, participants who understood the concept of external costs in the experiment are responsible for the observed reduction. The short-term price elasticity is -0.31, which is at the same level as for gasoline

price increases. Participants in the information group also showed reductions, but not to a statistically significant extent. The results were tested for robustness in a series of tests and confirmed. The MOBIS study shows that Pigovian transport pricing in Switzerland would have the intended effects and that these could be enhanced by targeted information. It also seems plausible that longer-term adjustments in behavior, which could not be tested in this experiment, would lead to a larger effect.
edoc-URL https://edoc.unibas.ch/85936/
Full Text on edoc Restricted;
Digital Object Identifier DOI 10.3929/ethz-b-000500100