QUANTIFYING PREFERENCES FOR THE ADOPTION AND USE OF PV IN PRIVATE HOUSEHOLDS IN AUSTRIA

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Overview

The transition to a sustainable energy system necessitates a substantial increase in the share of renewable energy sources, with solar photovoltaics (PV) playing a pivotal role. Despite the technological maturity and declining costs associated with PV systems and battery storage solutions, significant untapped potential remains for their large-scale deployment. This potential is constrained by a combination of individual, technical, regulatory, and administrative barriers (Atasoy et al., 2021; Galvin et al., 2022; Fleiter et al., 2023). This study aims to systematically identify these barriers and propose actionable solutions to promote the socially equitable and sustainable diffusion of PV systems.

The primary objective of the research is to evaluate the determinants of PV adoption among Austrian households, focusing on motivations and preferences. The study employs a detailed survey instrument designed to explore financial, technical (e.g., building-specific characteristics such as multi-family dwellings), and environmental factors influencing the decision to install PV systems.

Additionally, the study examines an alternative explanatory framework for technology adoption, which involves the concurrent adoption of complementary technologies, such as heat pumps and electric vehicles, alongside PV systems. The integration of PV systems may serve as a complementary investment to prior expenditures on energy-intensive consumer goods, potentially inducing spillover effects that enhance the economic feasibility of these technologies (Atasoy et al., 2021; Priessner & Hampl, 2020).

Methods

We designed an online survey to address PV adoption and utilization in Austria, which has been carried out in early January 2025. This research adopts an empirical approach, employing a structured, quantitative online survey targeted at a representative sample of 1,000 private households in Austria. The sampling framework was meticulously designed to ensure representativeness in terms of geographic distribution, age, and gender, type of housing, thereby accurately reflecting the demographic characteristics of the population in Austria.

The survey instrument was divided into two distinct parts. The first part targeted households that had already installed a PV system and collected detailed data on electricity consumption patterns, adoption motivations, housing characteristics, and the use of their PV systems. The second part focused on households without PV systems, to identify and analyze the factors preventing installation. This latter section included questions on housing conditions and electricity consumption to provide a sound comparative analysis between the two groups.

To analyze the survey data, propensity score matching (PSM) was employed, as outlined by Atasoy et al. (2021). PSM is a robust statistical method used to estimate the causal effect of PV adoption by controlling for confounding variables, such as household income, property ownership, type of housing, and geographic location. This methodology facilitates a rigorous and unbiased comparison between private households with and without PV systems, enabling a causal interpretation of the results.

Results

Preliminary results indicate that the primary motivation for installing PV systems is financial in nature. These systems are perceived as attractive either due to cost savings from self-generated electricity or through the meaningful combination with other renewable energy technologies, such as heat pumps or energy-intensive applications such as electric vehicles.

On the other hand, the likelihood of installing a PV system is significantly influenced by whether a household owns or rents their property, the type of building they live in, as well as recent changes in support policies such as VAT exemptions. Households in multi-family buildings exhibit a significantly lower probability of installing PV systems.

This is often due to structural barriers, limited influence of individual residents, or a lack of incentives for collective investment. Our results suggest that the recent boom in balcony PV systems is circumventing part of this imbalance.

Conclusions

Our findings have important implications for the adaptation of existing regulatory frameworks and the redesign of incentives, particularly for groups that have found it difficult to install PV systems. These include, first and foremost, tenants and residents of multi-family buildings, who require specific support measures and tailored regulations to reduce barriers and enhance the attractiveness of collective investments.

References

[1] Atasoy A.T., Schmitz H., Madlener R. (2021). Mechanisms for Rebound Effects of Solar Electricity Prosuming in Germany, FCN Working Paper No. 10/2021, Institute for Future Energy Consumer Needs and Behavior, RWTH Aachen University (revised 2023).

[2] Braito, M., Flint, C., Muhar, A., Penker, M., & Vogel, S. (2017). Individual and collective socio-psychological patterns of photovoltaic investment under diverging policy regimes of Austria and Italy. Energy Policy, 109, 141-153.

[3] Fleiter J., Atasoy A. T., Madlener R. (2023). Household Responses to the Tax Treatment of Income from Solar PV Feed-in in Germany, FCN Working Paper No. 8/2023, Institute for Future Energy Consumer Needs and Behavior, RWTH Aachen University.

[4] Galvin, R., Schuler, J., Atasoy, A. T., Schmitz, H., Pfaff, M., & Kegel, J. (2022). A health research interdisciplinary approach for energy studies: Confirming substantial rebound effects among solar photovoltaic households in Germany. Energy Research & Social Science, 86, 102429.

[5] Priessner, A., & Hampl, N. (2020). Can product bundling increase the joint adoption of electric vehicles, solar panels and battery storage? Explorative evidence from a choice-based conjoint study in Austria. Ecological Economics, 167, 106381.