

WHAT DETERMINES CONSUMERS' RESPONSIVENESS TO ENERGY COSTS OF DURABLE GOODS? EVIDENCE FROM THE SWISS APPLIANCE MARKET

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Overview

Energy efficiency has a fundamental role to play in the transition towards a more competitive, secure and sustainable energy system. EU countries have agreed on a 2030 framework for climate and energy, which sets new and challenging targets for the European Union post-2020 low carbon framework. Among these targets is a binding commitment to improve energy efficiency by at least 27% for the year 2030, compared to projections of future energy consumption based on the current criteria. Recently, the Commission even increased the energy efficiency target for 2030 to 32.5% within the new Energy Efficiency Directive. As part of the European Green Deal, the proposed targets towards a climate-neutral EU are even more ambitious. Similarly, Switzerland set high targets such as a reduction in energy consumption of 43% until 2035 compared to 2000 levels and a reduction of greenhouse gases by 50% until 2030 compared to 1990 levels.

The residential sector in European countries requires around one third of the end-use electricity, therefore policies using appropriate steering mechanisms are important to reduce electricity consumption, especially in the presence of the so-called Energy Efficiency Gap (Jaffe and Stavins 1994). The potential explanations for an under-investment in energy-efficient household appliances can be attributed to either market failures or behavioural failures (Broberg and Kazukauskas 2015). Market failures that prevent investments in energy-efficient appliances can take the form of information problems (e.g., lack of information and information asymmetries), misplaced incentives and principal-agent problems such as the landlord-tenant problem. In this framework, Sallee (2014) furthermore defined some attributes of choice sets that may lead to rational limited attention to energy efficiency when choosing among energy-consuming durable goods.

However, even if market failures could be overcome, several behavioural failures such as bounded rationality, loss aversion, status-quo bias, risk aversion or inattentiveness potentially reduce the level of efficiency in a household's energy use. In this context, there is an ongoing debate whether consumers are fully informed and attentive when investing in energy consuming durable goods. Houde (2018) found that a large share of consumers do not consider energy information in their appliance purchasing decisions. Gillingham et al. (2021) found that US consumers undervalue vehicles' fuel economy on average. On the other hand, Houde and Myers (2021) found that US consumers investing in a new refrigerator are indifferent between \$1.00 in discounted future operating costs and \$1.00 in purchase price. In light of the mixed evidence, it is interesting to analyse potential mechanisms behind heterogeneous valuations of energy costs. For instance, Brent and Ward (2018) show that an increase in financial literacy increases the willingness to pay for energy efficiency in a stated preference setting.

In this paper, we intent to add to the literature by providing an answer to the following questions in a revealed preference setting: Are consumers responsive to energy costs versus purchases prices in the Swiss appliance market? Does information provision impact the valuation of energy costs? Are different levels of energy-related financial literacy or rational inattention factors driving heterogeneous valuations of energy costs?

Methods

We use data collected in the course of a field experiment conducted in Switzerland, where a random group of participants received customized information about the potential of monetary savings from adopting new, comparable, and efficient durables (Boogen et al. 2022). Using in-home visits, we collect unique information on the characteristics of participants' household appliances. This way, we can recover choices of 700-800 durable goods (refrigerators, freezers, dishwashers, washing machines, and tumble dryers) between 2014 and 2019. Using a baseline survey, we further collected data on income, education and other socio-demographic and housing factors, as well as information on the amount of energy services consumed within a household and on the level of energy and financial literacy. For every participant that filled in the baseline survey, the corresponding utility additionally provided us with information on annual electricity consumption and expenditure. We obtained the set of alternatives people were choosing their large household appliances from by collaborating with the price comparison website

“toppreise.ch”. This website provided us with the product attributes such as energy consumption, size or price for almost all appliances offered on the Swiss market in each year.

We rely on discrete choice models in order to analyse the purchase decisions of the participants. In a first step, we estimate a simple conditional logit model that serves as a benchmark to characterize the preferences of an average consumer. In a second step, we exploit models that are more flexible in terms of substitution patterns but computationally quite expensive, such as the random coefficient logit. Our rich data furthermore allow us to handle potentially endogenous explanatory variables.

Results

Preliminary results that do neither consider endogeneity of independent variables nor rely on the most flexible models in terms of substitution patterns suggest that valuation of energy costs varies across appliances. For instance, we find an undervaluation of energy costs for washing machines but an overvaluation for refrigerators. However, the reasons for the heterogeneity in valuation across appliances, such as differential biases, usage dependence or varying attributes of choice sets, are to be explored.

Furthermore, we find that providing information about the potential of monetary savings from adopting new, comparable, and efficient durables increases the valuation of energy costs significantly for both refrigerators and tumble dryers. Additionally, participants that are associated with a high value of financial literacy are estimated to value operating costs of freezers more on average.

Conclusions

Policymakers might consider introducing informational campaigns that provide personalized information in order to increase the adoption of energy efficient durables and thus help to reach the goals of energy conservation. Furthermore, policy measures could target the promotion of the level of energy-related financial literacy through educational programs in order to help households to improve their abilities in making calculations for investments in energy efficiency. Another interesting instrument could be the promotion of life-time cost calculators for appliances, which make investment calculations easier for households.

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