

BOUNDED RATIONALITY, ENERGY LITERACY AND THE DISPLAY OF INFORMATION ON HOUSEHOLD APPLIANCES

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Overview

Improving the energy efficiency in the residential sector is one of the strategies to reduce total fossil energy consumption and related CO₂-emissions in Switzerland, to eventually meet the energy policy goals established in the Swiss 'Energy Strategy 2050'. One important means to reduce electricity consumption of Swiss households is to foster the adoption of energy-efficient household appliances. One barrier, however, is often referred to as the 'energy-efficiency gap', i.e. the frequent observation that individual decision-makers do not choose the most energy-efficient appliance, even if this appliance is also the most cost-efficient choice (minimizing lifetime operating costs). This can be explained by the fact that individuals maximize utility without having acquired all possible information and without having traded-off all alternatives ("bounded rationality"). As a consequence of being boundedly rational, individuals tend to overvalue upfront-costs compared to future operating costs and therefore do not invest in highly efficient appliances. One barrier for considering future operating cost in appliance choice is the is a lack of information about future energy costs and how to evaluate them. The research presented in this paper deals with the question how information on the future energy consumption of an appliance should be displayed on products in order to enable consumers to make a rational and informed choice, and hence to choose the most (cost-)efficient appliance. In addition, we examine individuals' cognitive abilities to process the provided information.

With respect to the question how to display information to enable consumers to choose more energy-efficient appliances, some existing research evaluates the role of declaring future energy consumption on the energy label of an appliance, either in the form of monetary information or physical information. The results of these studies are inconclusive as they find different effects. While McNeill and Wilkie (1979) and Anderson and Claxton (1982) do not find any effects, the results in Heinzle (2012) and Newell and Siikamäki (2013) suggest that displaying monetary information supports the choice of more efficient appliances. However, in these papers, the applied decision strategies of respondents remain a 'black box'. In this paper, we compare individual appliance choice in a randomized online experiment given either monetary or physical information about future energy consumption. We control for the applied decision strategies and the respondents' energy and investment literacy, their attitudes towards energy conservation, as well as their sociodemographics.

We find that displaying consumption information in monetary terms enhances individuals' ability to make an investment calculation and to choose the most efficient appliance.

Methods

To test our hypotheses, we ran an online experiment among customers of a Swiss electricity provider. In this online experiment, respondents were asked to imagine a situation in which they need to replace their refrigerator. They were given a choice between two refrigerators that differed only in terms of their purchase price and their energy consumption. The remaining characteristics of the two refrigerators were identical. The information was presented in the same way as it is presented in the current version of the EU energy label for refrigerators. Respondents were randomly assigned to one of two different treatments. In Treatment 1, the information on yearly energy consumption of the two appliances was displayed in terms of physical consumption (kWh), as it is displayed in the current version of the EU energy label. In Treatment 2, the information on electricity consumption was displayed in monetary terms, i.e. in the form of an estimate of the yearly energy cost. After data cleaning, we have valid and complete data for 877 survey respondents that can be used for our analysis. We decided to follow two empirical strategies. First, we estimate a probit model with the dependent variable representing the choice of the most (cost-)efficient appliance. This model gives us some preliminary insights on the factors that influence the choice of the appliance that minimizes total cost over the entire lifetime. Second, we estimate in an explorative way a series of bivariate probit models in order to explain the choice of the appliance as well as the choice of the decision making strategy.

Results

We find that the probability to identify the most cost-efficient appliance increases if the respondents is relatively young, male, has an academic degree, has a good knowledge of the usage cost of different appliances and is able to make complex calculations. The effect of being in the treatment with monetary information on yearly energy usage is strong and highly significant. As expected, also the probability to make an investment calculation is significantly increased when the respondent was in the treatment with information on yearly operating cost, suggesting that displaying information on the yearly energy consumption of an appliance in monetary terms rather than in physical units increases the individuals' ability to make an investment calculation. Yet, individuals who are likely to use the energy rating on the label as a decision heuristic do not seem to be influenced by the treatment, i.e. their decision-making strategy seems completely independent from the kind of information that is displayed on the label in addition to the energy-efficiency rating. The fact that the monetary information treatment seems to impact on the probability to make an investment calculation but not on the probability to use the energy-efficiency rating on the label as a decision-making heuristic gives some support for the hypothesis that the information on yearly energy costs is more likely to be processed by individuals who have the cognitive prerequisites to make an investment calculation.

Conclusions

The results from our experiment support earlier findings that displaying information about energy consumption of appliances in monetary terms (CHF) rather than in physical units (kWh) enhances consumers' ability to choose the most (cost-)efficient appliance on offer. The main contribution of this paper is to relate the choice of the appliance in the two information treatments to the underlying decision strategy. This sheds light on the decision-making process underlying the choice of electric appliances. We find that the individuals' ability to do an investment calculation when deciding between two electrical appliances is also increased when displaying yearly energy cost. Furthermore, specific types of individuals seem to be more likely to do an investment calculation: these individuals are relatively young, male, hold an academic degree and are able to do complex calculations.

Another group of individuals seems to be more likely to use the energy-efficiency rating on the energy label as a decision-making heuristic. These individuals are likely to be relatively old, female, with no academic degree and less able to do complex calculations such as calculating compound interest. Their probability of using the efficiency-rating as a decision-making heuristic is not influenced by the treatment, i.e. they do not seem to be responsive to the treatment. This is in line with the results reported in Hille et al. (2015) and Waechter et al. (2015) who find that individuals who follow the energy-efficiency rating on the label tend to disregard additional information that is provided with the label. Potentially, these individuals do not dispose of the necessary energy and investment literacy to process the provided information and therefore rely on the rating scale.

The main conclusion for policy makers is that providing energy-efficiency ratings on energy-using durables can be a very effective strategy to increase the adoption of energy-efficient appliances, as many respondents use the label as a decision-making heuristic and seem to consider the energy-efficiency rating as a recommendation. However, the results presented in Hille et al. (2015) and Waechter et al. (2015) demonstrate that this may lead to undesired choices if individuals disregard the additional information provided on the label. Our results show that informed and rational choices of appliances can be enhanced by the provision of monetary information on yearly energy consumption. Furthermore, we could show that individuals who are relatively younger, male and who possess high cognitive abilities were more likely to correctly process the provided information. It can therefore be concluded, that enhancing an individual's energy-related knowledge and the ability to make complex (investment) calculations seems to be one important prerequisite to empower consumers to make rational and informed energy-related choices.

References

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