HOW CHOICE COMPLEXITY IN LIBERALIZED MARKETS HURTS THE DEMAND FOR GREEN ELECTRICITY

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Overview

Many countries have liberalized their residential electricity markets or are considering to do so. Liberalization provides consumers with more freedom of choice but also leads to higher choice complexity as consumers face a much larger number of different electricity contracts to choose from. We hypothesize that consumers react to this increased choice complexity in liberalized markets by applying simplified decision strategies that allow them to reduce cognitive effort. In particular, we predict that with increasing size of choice sets, consumers focus more on simple price attributes of electricity contracts and less on the relatively complex environmental attributes, leading to a decrease in the demand for green electricity. In two online experiments conducted in a representative (n=610) and a student sample (n=1,212) in Switzerland, we find that indeed when faced with a larger choice set participants focus more on prices and choose cheaper electricity contracts containing less renewable and more conventional energy than when faced with a smaller choice set. In addition, we also find evidence that a tax on conventional energy is a more effective policy instrument for shifting demand towards renewables than behavioral instruments in the form of social norm interventions or a pre-selected default contract in the student sample. In the representative sample, where we tested only the default contract as a policy instrument, we find evidence, however, that the pre-selected default contract was successful in effectively increasing the consumption of green electricity in the small and the large choice sets. Our results suggest that a liberalization of the household electricity market has to be carefully managed such that consumers are not overwhelmed and do not shift their demand to cheaper but less environmentally-friendly energy sources.

Methods

We conduct an incentivized online economic experiment to investigate what this massive increase in choice set size, when moving from a non-liberalized to a liberalized electricity market, means for consumer choice and the demand for green vs. conventional electricity. We conduct our experiment in Switzerland where the residential electricity market has not been liberalized yet. Building on the literature from cognitive psychology and behavioral economics on choice overload and the use of heuristics to simplify complex choices, we hypothesize that when faced with larger compared to smaller choice sets of electricity contracts, consumers focus more on electricity prices as an important attribute of a contract, and less on the energy sources or the environmental consequences of the electricity generation, because they try to reduce the cognitive complexity of the choice. In our experimental set-up, participants had to choose one electricity contract from either a small or a large choice set of contracts that differed in price and in source (nuclear, hydro, wind, or solar) and origin (Switzerland or Germany) of electricity production. The small choice set, consisting of only six different contracts from which participants could choose, was designed to represent the current monopolistic situation of the Swiss residential electricity market. The large choice set, consisting of sixty different contracts to choose from, represented the situation in a liberalized market. Importantly, participants' choices were incentivized such that they had to pay more money (which means they earned less money for their participation in the experiment) for choosing greener contracts. The price structure mirrored the current average price structure for different electricity sources for end-consumers in the Swiss residential electricity market. To incentivize the choice of electricity sources, we bought certificates of origin according to participants' choices. We conducted two studies. One in a nationally representative sample (n=610) to test our main effects and one behavioral policy instrument, the default contract which is a common feature of choice sets in the electricity market. The second study was carried out in a larger but non-representative sample of student participants (n=1,212) to be able to include more experimental conditions testing additional policy instruments in the small and the large choice set conditions. In this sample, we included a standard policy instrument which consisted of a tax on conventional electricity. Further, we included three behavioral policy instruments: a descriptive and a prescriptive norm as well as a pre-selected default contract. In both samples, treatments were randomly assigned to participants via a randomizing function within the experimental software.

Results

In both samples, participants in the large choice set chose chose cheaper contracts than participants in the small choice sets. In our set-up, electricity contracts with a higher share of non-renewable energy were cheaper than electricity contracts with a high share of renewable energy. This mirros the current price situation in the Swiss electricity market where renewable energy is still more expensive than non-renewable energy. Thus, by choosing cheaper contracts, participants in the large choice set effectively chose contracts with a higher share of grey energy. The results indicate that the large choice set (compared to the small choice set) indeed decreased the demand for green electricity. Note that even though the effects of the large choice set on the prices paid and the demand for green electricity are statistically significant, they are rather small according to typical categorizations of effect sizes in behavioral studies. Calculating Cohen's d, a frequently used measure of effect size, yields d=.13 and d=.12 for the large choice set's effect on prices paid and d=.14 and d=.18 for the effect on the shares of green electricity (in the representative and the student sample, respectively). An effect with a d ~ .20 is usually considered a small effect. To gather evidence on people's choice processes, and in particular on the importance of the price attribute in the small compared to the large choice set, we featured sorting options on the decision screens in our experiment. The standard display of electricity contracts was in a random order. However, participants had the possibility to sort contracts by either price or name. We find that participants in the large choice set conditions chose to sort by price significantly more often than participants in the small choice set conditions in both samples. In the post-experimental questionnaire, we asked participants to rate (on 5-point Likert scales) how difficult they had perceived the electricity contract choice to be and to indicate how important the prices respectively the energy sources were for their decisions. In both participant samples, people in the large choice set perceived choosing an electricity contract as significantly more difficult than people in the small choice set. The manipulation of the choice set size we implemented in our experiments thus indeed led to a more complex choice environment in the large choice set conditions. We also find that in both choice sets in the student sample, the standard policy instrument of a tax on conventional electricity was most effective in fostering the demand for green electricity. The behavioral instruments were directionally successful in increasing the demand for green electricity in the small choice set (even though not in a statistically significant manner). They were clearly ineffective in the large choice set. This is in line with price considerations becoming more important in the large choice set. In the representative sample, however, we found that the default contract was effective in significantly increasing the demand for green electricity. With regard to the geographic location of electricity production, we find that consumers in general have a preference for domestically produced electricity, especially hydro energy.

Conclusions

Our results lead to a number of policy recommendations. First, in order to make sure that after a possible market liberalization consumer demand does not shift away from renewables back to conventional energy, policy makers could consider taking or promoting certain accompanying measures. As the results from our experiment indicate, consumers react to an increased choice complexity in larger choice sets by applying simpler decision strategies. In the case of electricity contract choices, an easy choice strategy for consumers is to focus more on prices and less on environmental attributes. This effect could potentially be countered by trying to make environmental attributes easier to understand and process for consumers. Second, our results indicate that, the standard economic intervention in the form of a tax on nuclear electricity is more effective than social norm interventions for shifting demand towards electricity from renewable sources. In our experiments all social norm interventions failed to produce statistically significant effects. Concerning default contracts, our study finds evidence that implementing green default contracts can effectively increase the consumption of green electricity. However, the effectiveness of the default contract was limited to the representative sample. This shows that the benefits of a default contract do not just happen by itself and its construction and introduction needs to be carefully monitored. As we have implemented only a limited number of behavioral interventions, future research should continue testing the effectiveness of different forms of behavioral interventions (social norms and others) to reach the desired policy goals in the household electricity market. When successful, behavioral interventions are highly attractive policy tools, as they are often low-cost measures which are easy to implement and still guarantee the freedom of choice to the consumers. With regard to the implementation of a tax as a policy instrument to steer the demand in the household electricity market, important questions remain concerning the exact design as well as the public and political support for such a tax. In our experiments, we applied a simple uniform tax on conventional (nuclear) electricity. However, there are other possible forms of taxes such as basing the level of the tax on the carbon intensity of the energy production or on other environmental impacts. An important question concerning the introduction of a tax is the support of the public. Future research should therefore shed light on which tax design is best at achieving the desired results and at the same time obtaining public and political support. In conclusion, we hope that our results provide helpful inputs into the discussion about the liberalization of energy markets for private households and the effects of such liberalization measures on the demand for green electricity. Our results can also be applied in a more broader context. Generally, policy makers should pay attention to the design of the consumers' decision environment in the household electricity market, as this may have relevant effects on the relative demand for green vs. conventional electricity.