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Towards Sustainable Energy Consumption Electricity Demand Flexibility and Household Fuel Choice

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Towards Sustainable Energy Consumption: Electricity Demand Flexibility and Household Fuel Choice

Abstract

Paper [I] investigates household heterogeneity in valuing electricity contract attributes that include various load controls and information sharing to induce demand flexibility. Using a stated preference choice experiment conducted with Swedish households, this paper shows that, although a large proportion of households asks for substantial compensation, some households are willing to share their electricity consumption information and require relatively lower compensation to allow load controls. In addition, this paper finds that some households that are willing to provide flexibility by accepting load controls at a relatively low compensation ask for sizeable compensation to share their electricity consumption information, and vice versa. From the perspective of the contract providers, these findings suggest that information-optional contracts can generate more customers than contracts that bundle households' consumption information with various load controls.

Paper [II] uses a flexible model to accommodate heterogeneous decision rules in analysing data obtained from a discrete choice experiment aimed at eliciting Swedish households' willingness to accept compensation for restrictions on household electricity and heating use during peak hours. The model combines behavioural processes based on random utility maximization with an elimination-by-aspects (EBA) strategy, where the latter involves a two-stage decision process. In the first stage, respondents are allowed to eliminate from their choice set alternatives that contain an unacceptable level, in this case restrictions on the use of heating and electricity. In the second stage, respondents choose between the remaining alternatives in a rational utility maximizing manner. Our results show that about half of the respondents choose according to an EBA type strategy, and considering elimination-by-aspects behaviour leads to a downward shift in elicited willingness-to-accept.

Paper [III] tests the effect of a pro-environmental framing on households' stated willingness to accept restrictions on their electricity use. We use a split-sample choice experiment and ask respondents to choose between their current electricity contract and hypothetical contracts featuring various load controls and monetary compensation. Our results indicate that the pro-environmental framing has little impact on the respondents' choices. We observe a significant framing effect on choices and marginal willingness-to-accept for only a few contract attributes. The results further suggest that there is no significant framing effect among households that are already engaged in pro-environmental activities.

Paper [IV] explores the socio-demographic and housing characteristics that affect household fuel choice and fuel use decisions in urban Ethiopia. The results indicate that, whereas households with a female head are more likely to combine traditional solid (firewood and charcoal) and modern (electricity) fuels for different uses, households with less-educated heads, many family members, and poor living conditions (fewer rooms) tend to use traditional solid biomass fuels. We find that households with an individual electricity meter are significantly less likely to use charcoal. Further, the results show the satiation effect from the increasing use of a fuel by households is relatively higher for firewood and lower for electricity.

Keywords

Choice experiment, demand flexibility, electricity contract, fuel choice, fuel stacking, household heterogeneity, load control, pro-environmental framing, willingness-to-accept

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