

Linear or non-linear pricing: What can we learn from the lab about individual preferences for electricity tariffs?¹

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Consumers are often faced with different tariffs when buying cell phone, electricity or gas contracts or trains and airplane tickets. On the one hand, the standard line is that choice is good for consumers, that it confers on them freedom, responsibility, self-determination, autonomy and lots of other things. On the other hand, too much choice might stress them out: it is a complex task with no clear-cut trade-off in practice which may result in high cognition cost for consumers which they may not be willing to support. Typically, what should consumers choose between a simple flat tariff pricing and a more complex - but also more advantageous - non-linear tariff structure, which create multiple marginal prices for the same good?

From the supply side, there exist valid reasons for implementing more sophisticated tariffs such as time-of-use pricing, critical peak pricing or real-time pricing as an instrument to influence demand response and provide the needed flexibility to the electricity system. But to be effective, such dynamic pricing needs first, to be perceived and understood correctly by consumers and second, to incent them to adopt the proper consumption behavior (in terms of energy conservation, reduction or shifting of their electricity usage during peak periods etc.).

Although the type and the complexity of a tariff can influence neither the value, nor the price of the good, the consumer's ability to evaluate the potential bill might be seriously affected. Therefore, there is an increasing need for better assessing the choice process and the elements that may cause the confusion in the perceived tariff and the rejection in the consumers' attitude. For example, Ito (2014) finds strong evidence that consumers faced with the choice between different nonlinear pricing respond to average price rather than marginal or expected marginal price. This empirical result, based on field data, contradicts the standard theory prediction that consumers optimize based on marginal pricing. This suboptimizing behavior make nonlinear pricing unsuccessful in achieving its policy goal of energy conservation and force suppliers to reconsider their pricing strategy to take into account cognitive bias.

For the final electricity consumer, the choice of a tariff may be considered as a risky and often an uncertain decision, related to the fact that the customer doesn't know *ex ante* the exact amount of electricity needed and therefore the monetary impact of the tariff choice. That is why it is important to look more carefully into the issues of consumer tariff choice through the lenses of behavioral economics, like the results of the prospect theory (Kahneman et Tversky, 1979). Thus, this research work intends to go deeper into tariff choice analysis and to get some insights on the relation between the risk taking attitude of individuals and

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tariff choice and to what degree does the tariff selection depend on the riskiness of a tariff. Moreover the impacts of framing effect (past experiences, social norms or the way in which the alternative is presented) or loss aversion assumption on the energy tariff choice is put into question.

We use the experimental methodology to evaluate in a laboratory environment, the impact of several particularities of pricing structures. We aim first at evaluating subjects' response to different pricing plans and second at identifying distinct specific biases related to electricity pricing that hinder comprehension and acceptability. We create a decontextualized environment in the laboratory where subjects have to take 30 successive independent decisions regarding the choice between two tariffs which differ in terms of risk level (with regard to the level of demand), expected gains, linear or non-linear structure, constant marginal cost etc. Only the laboratory can provide the necessary control possibility over the environment, such that one can disentangle the different potential motivations for the rejection of more complex tariffs. Based on some behavioral insight derived from the literature in behavioral economics and previous experimental economics contribution on tariff choices, our work helps to address more directly and explore more thoroughly the key biases and barriers specific for each tariff typically used for electricity. By using different types of nonlinear pricing configurations, we assess subjects' willingness to engage with different types of tariffs and the impact of different explanations and presentation alternatives on subjects' perception. We discuss how each tariff effect, that we identify, can be linked to and explained by several decision biases, whereas the behavioral frame used is mainly based upon the prospect theory (Kahneman and Tversky, 1979; Starmer, 2000) and the expected utility theory principles.

Overall, our results confirm the main cognitive bias identified in the literature. In particular, we show that, in the lab, even when the more complex non-linear tariff structures are 50% more advantageous, consumers constantly stick to the tariff with the most simple structure. Subjects repeatedly avoid pricing instruments containing a fixed cost and increasing block pricing structures.

The paper is organized as follow. Section 2 presents the literature review on tariff choice. Section 3 presents and justifies the experimental design and procedure. In section 4, we present our results and conclude in section 5.

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