

PRICE VOLATILITY INFORMATION AND CONSUMER CHOICE IN ELECTRICITY MARKETS

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Overview

Inefficient electricity pricing, such as flat-rate plans, contribute to overconsumption of electricity and increased pollution (Ito and Zhang, 2020). However, utilities and policy makers have not been successful at increasing consumer participation in variable rate plans. Indeed, by recent estimates, fewer than one percent of residential electricity customers in the U.S. face electricity prices that correspond to generation costs (Burger et al. 2020). The traditional assumption is that consumers are risk averse and necessarily view price volatility as a “bad.” But we do not know whether this assumption is correct because, at this time, consumers are not given any price volatility information when they choose among electricity plans. In this study, we conduct a choice experiment to better understand whether electricity consumers understand price volatility information, and whether the way in which this information is presented affects their likelihood of signing up for a variable rate plan. We find that consumers are less willing to pay for a variable rate electricity plan when presented with price volatility as a percentage above or below an average rate (say, 10 cents per kilowatt-hour (kWh) $\pm 5\%$). However, they are more willing to pay for a variable rate plan when presented with price volatility as a range in an expected monthly bill (say, \$90-110). It is possible that the lower bound of the bill range presents a compelling anchoring point. Our results show that the way in which price volatility information is presented is important, and can help facilitate a transition toward variable-rate pricing.

Methods

We conduct an online choice experiment in which respondents face 16 choice tasks, with each choice task presenting two potential electricity plans. For each plan, respondents are given information about the average expected electricity price, the level of price volatility, the length of contract, the plan’s share of renewable energy, whether the utility providing service is a local or national company, and the customer satisfaction rating of the provider. For each choice task, respondents either select the electricity plan they prefer, or opt out by selecting neither plan. We randomize respondents into two treatment groups, with each group facing identical information except for price volatility. The first treatment group sees price volatility as a percentage above or below an hourly rate (say, $\pm 5\%$). The second treatment group sees price volatility as a range in their monthly bill (say, \$90-110) for monthly consumption of 1,000 kWh. To make the plan choices as realistic as possible, we align plan characteristics with the most recent historic data from U.S. electricity markets. To help us control for some salient features of choice, we also ask respondents a series of question about their risk preferences (DOSPERT scale), environmental preferences (New Ecological Paradigm scale), and demographic and socioeconomic characteristics.

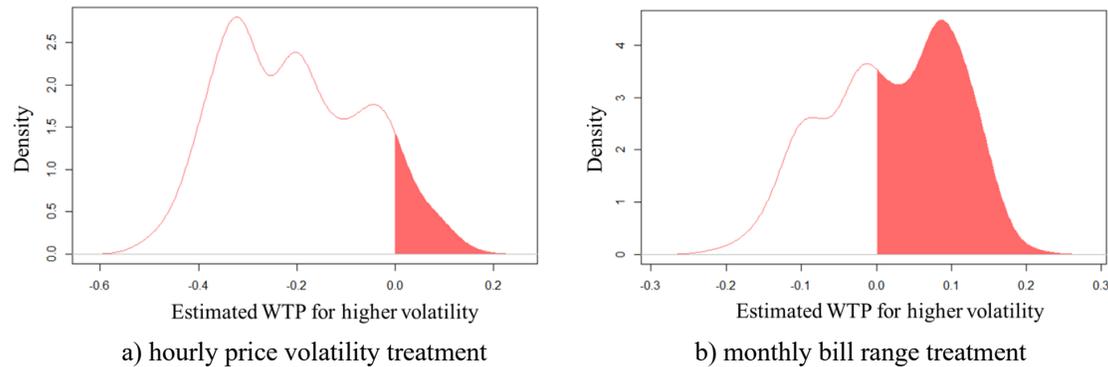
We recruit respondents using an online participant recruiting company Prolific. Our target population is the general population of the U.S. that is at least 18 years old. We use an abbreviated pilot survey to calibrate Bayesian priors for the main choice experiment. We then model consumer preferences using a random utility model and estimate utility empirically in willingness-to-pay (WTP) space.

Results

Our WTP results reveals that consumers are willing to pay less for a variable rate plan when they are presented with price volatility as a percentage above or below an average rate, but that they are willing to pay more for a variable rate plan when presented with a monthly bill range. Figure 1 displays distributions of WTP estimates for each of the two treatments. The distribution on the left depicts respondents’ willingness to pay for higher price volatility when presented with a deviation from an hourly rate, while the distribution on the right shows respondents’ willingness to pay for higher price volatility when given a monthly bill range. Positive WTP values are highlighted in red. The share of respondents willing to pay more for higher price volatility under the monthly bill treatment is much higher than under the hourly price treatment. Importantly, the mean WTP in the monthly bill treatment group is positive and

statistically significant, while the mean WTP in the hourly price treatment group is negative and statistically significant.

Figure 1: WTP distributions under hourly and monthly price volatility treatments



One way to interpret this result is that a monthly bill range is a more intuitive way to communicate the potential consequences of price volatility than a percentage deviation from hourly rate. So consumers are better able to incorporate this information in their decision making. Another interpretation is that consumers use the low bound on the monthly bill range as a compelling anchoring point. And since this number suggests the possibility of saving money from variable rates, willingness to pay for this feature increases.

Conclusions

Starting in the 1990s, electricity market restructuring in the U.S. has led to more efficient generation dispatch (Cicala 2022). But introduction of retail competition has not led to similar efficiency gains on the demand side. In this study we examine whether giving electricity consumers information about expected price volatility affects their perception of variable rate plans. We find that the way in which this information is presented is at least as important as the information itself, and consumers have a more positive perception of variable rate plans when given more intuitive measures of price volatility.

References

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