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AN ANALYSIS ON RESIDENTIAL CUSTOMERS' CHOICE BEHAVIORS OF ELECTRICITY TARIFFS: FOCUSING ON FLAT TARIFFS AND TIME-OF-USE TARIFFS

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Overview

Demand response (DR) is expected to be one of measures to reduce electricity demand in peak time, shift demand from peak time to off-peak time, and reduce investment in supply capacity for peak demand in Japan as well as Europe and the US. Time-of-use (TOU) tariffs are one of measures to give customers incentives to reduce electricity demand in peak time. Japanese government have accelerated investigation of DR by conducting some pilot projects for DR and starting discussion of smart meter rollout after the Great East Japan Earthquake on March 11th in 2011 and the subsequent power shortage. The government also decided that retail electricity market would be fully liberalized in 2016 to increase number of options of electricity tariffs including TOU tariffs for residential customers as well as to improve economic efficiency through retail competition. Some Japanese electric power companies have already started providing new TOU tariffs to encourage residential customers to reduce peak demand after the power shortage in 2011.

It is required to pay attention to self-selection problem as Ericson (2011) studied when DR programs are introduced, because effect of DR could be smaller than effect observed in pilot projects when most of customers choosing TOU tariffs could reduce electricity cost without reducing and shifting their peak demand. In this respect, it is important that a large number of customers, who have large potentials of reduction and shift of peak demand, and are willing to reduce and shift peak demand, choose TOU tariffs. In order to increase benefit of retail competition after liberalization, it is important that more customers are willing to search and choose better tariffs as well as switching suppliers.

However, actual experiences show that residential customers were not willing to search, choose and switch electricity tariffs and suppliers (ECME Consortium, 2010). It could be because switching cost, complexity of tariffs, bounded rationality of customers and lack of information could inhibit customers from choosing and switching behaviors based on behavioural economics (Ofgem, 2011) and theory of consumer psychology and behavior. However, there are not enough empirical studies focusing on actual customers' choice behaviors of electricity tariffs, while studies on residential customers' preferences of electricity tariffs and DR programs were conducted (Kaufmann et al., 2013, Dütschke and Paetz, 2013, Goto and Ariu, 2013). This study analyzes residential customers' choice behaviors of electricity tariffs and finds out barriers of customers' behavior focusing on flat tariffs and TOU tariffs after the earthquake and the power shortage in 2011 in Japan by taking into account self-selection problem in order to discuss diffusion measures of TOU tariffs and activation measures of residential customers' choice behaviors after liberalization of retail electricity market. .

Methods

Residential customers' choice behaviors of electricity tariffs was analyzed using data collected in consumers' questionnaire survey (n=8046) conducted in 2013. Customers' use and switching behaviors of electricity tariffs after the earthquake were surveyed. Use of electric appliances and customers attitudes related to assumed determinant factors were also surveyed as well as customers' demographics.

Firstly, I analyzed effects of potential of reduction and shift of peak demand and customers' willingness to save electricity on use of TOU tariffs against flat tariffs based on logit model. Secondly, I analyzed effects of assumed switching barriers such as switching cost (effort and time in switching process), complexity of tariffs, bounded

rationality of customers and lack of information taking into account customers' demographics and other assumed factors (e.g. customers' involvement) based on logit model.

Results

The survey result shows that approximately 64% of respondents used flat tariffs, and approx. 16% used TOU tariffs. The others (approx. 20%) didn't know their electricity tariffs. The survey also shows that more than 90% of respondents didn't consider switching tariffs after the earthquake in 2011. Approximately 4% of respondents considered switching, but didn't switch. Only 2% of respondents switched their tariffs. This result indicates that most of residential customers have not switched to new TOU tariffs at present, provided by some Japanese electric power companies for reduction of peak demand after the power shortage in 2011.

The analysis result of choice factors of TOU tariffs shows that customers, who have large potential amounts of reduction and shift of peak demand (such as customers living in larger houses and using a variety of electric appliances) and customers' willingness to save electricity were likely to use TOU tariffs. On the other hand, frequency of staying home didn't have significant effect on uses. These results indicate that self-selection problem is not crucial at present.

The analysis result of switching behaviors shows that lack of information and bounded rationality inhibit customers from switching behaviors. Especially, customers, who didn't received information about potential benefit of switching tariffs, were not willing to switch tariffs. Bounded rationality increased a probability of stopping switching after considering, while complexity of tariffs did not have an effect on customers' switching behaviors. This indicates that customers, who don't enough capacity for judgement, have trouble with making better choices, and are likely to stop switching behaviors regardless of complexity of tariffs. Switching cost didn't have an effect on customers' switching behaviors. It could be because switching processes were improved not to inhibit customers' from switching at present.

Conclusions

The analysis result indicates that it is important to increase customers' recognitions of benefit of switching tariffs. The result also shows that it is required to develop measures to enable customers to make better choices taking into account that bounded rationality inhibit from choosing and switching tariffs. It is required to investigate concrete measures for the better choices, such as easy-to-understand information about tariffs characteristics and more accurate prediction of electricity bill for each customer, rather than simplification of tariffs.

References

- Dütschke, Elisabeth and Paetz, Alexandra-Gwyn (2013), "Dynamic electricity pricing - Which programs do consumer prefer?", *Energy Policy*, 59, 226-234.
- ECME Consortium (2010), "The Functioning of Retail Electricity Markets for Consumers in the European Union: Final Report"
- Ericson, Torgeir (2011), "Households' self-selection of dynamic electricity tariffs", *Applied Energy* 88, 2541-2547.
- Goto, Hisanori and Ariu, Toshio (2013), "An Analysis of Residential Customers' Preferences for Measures of Peak Electricity Demand Reduction", *Journal of Public Utility Economics*, 65(1), 1-10. (in Japanese)
- Kaufmann, Simon, Künzel, Karoline and Loock, Moritz (2013), "Customer value of smart metering: Explorative evidence from a choice-based conjoint study in Switzerland", *Energy Policy*, 53, 229-239.
- Ofgem (2011), "What can behavioural economics say about GB energy consumers?".