Retail power market competition with endogenous entry decision—An auction data analysis

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ABSTRACT

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Deregulation in the electric power industry has been aimed at promoting competition and thereby enhancing the industry's efficiency. We use the auction data of public power procurements to study the impact of the reform on the retail power market in Japan. We quantify this impact by measuring a decline in power charges, controlling for the endogeneity bias caused by the entrants' bid-submission decisions. Our results suggest that power charges would decline by about 0.48 yen/kWh on average when two or more providers bid at an auction. *J. Japanese Int. Economies* **26** (3) (2012) 351–368. National Graduate Institute for Policy Studies, 7-22-1 Roppongi, Minato, Tokyo 106-8677, Japan; Graduate School of Economics and Business Administration, Hokkaido University, Kita 9 Nishi 7, Kita, Sapporo 060-0809, Japan.
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1. Introduction

To design better electric power industry reforms, it is essential to measure the effects of regulatory reforms and examine their achievements. The impact of regulatory reforms on power charges is one of the clearest types of evidence for this purpose. We investigate how much the regulatory reform in the retail market of the power industry promoted competition between the incumbents and the entrants and consequently lowered power charges. We take a micro-data approach to this issue, using public

power procurement auction data while paying attention to an endogeneity problem in the entrants' decisions about whether to submit bids for individual auctions.

In 1995, Japan initiated a series of regulatory reforms toward market-oriented power industry by deregulating entry in the wholesale power market. While establishing new rules and regulations for fair and efficient uses of the power network under the new regime, new power companies, called power producers and suppliers (PPSs), were allowed to engage in the retailing business of electric power competing with the incumbents that had long regionally monopolized the power market in Japan. The scope of this retail market deregulation was first set to large-scale industrial and commercial customers using 2000 kW or more of ultra-high voltage (UHV) power, and then gradually enlarged to other middle-scale customers using 500 kW or more of high voltage power in 2004, and further to those using 50 kW or more in 2005. How significant was the impact of the reform on the retail power market?

Kainou (2007) examined power companies' financial statements and found that the regional power companies had drastically restructured their investment and recurrent expenses to cut power charges in the 1990s by about 5%, anticipating the soon-coming severe competition induced by the reforms. The Agency for Natural Resources and Energy (ANRE) (2004) conducted an analysis using auction data for power supply to government and other public entities, which explicitly report whether there was competition among power companies, or typically, between the incumbents and the PPSs. It divided the original sample into two subsamples consisting of (A) samples with a single bidder and (B) samples with two or more bidders to compare the means of their power charges while controlling for effects of load factor.[1,2] It found that, in the cases with load factors no higher than 50%, the mean of the power charges in Group A was higher than that in Group B. That is, the competition led to a charge decline. This impact depends on load factor, which correlates with the likelihood of the PPSs' entry and thus the keenness of competition. For users with a load factor of, say, 43.6%, competition lowered the power charge by about 1.5%.[3]

Nevertheless, ANRE (2004) did not take into account the decision-making process by which the PPSs decide whether to bid in individual auctions. The data imply that while the incumbents bid in almost all auctions, the PPSs seem to carefully select only profitable ones that they had a sufficiently high probability of winning so as not to bear bidding costs for auctions they were likely to lose. In fact, as ANRE (2004) pointed out, the PPSs focus on cases with a load factor of about 30–50%. This suggests that the scope of competition is endogenously determined by the PPSs' bid-submission decision while the scope of deregulation is exogenously defined by the laws and ordinances.[4] Therefore, if we simply divide the original sample into these two subsamples using ex post information about the states of competition, we cannot estimate the true impact of the retail market deregulation through competition.

Hattori (2010) analyzed the bid submission by explaining the number of PPS bidders with attributes of individual auctions. Hattori (2010) found that the number of PPS bidders was increased by such factors as lower load factor, larger contract demand, and ultra-high voltage power supply, using a sample encompassing 949 public auctions for power supply starting in fiscal 2004–2006. He, however, did not investigate the impact of the number of PPS bidders or the state of competition on power charges. Hattori and Saegusa (2010) extended Hattori's (2010) study with the auction data for 2008 to measure the impact of the regulation of bidders' eligibility in regard to their carbon dioxide emissions on the number of bidders, PPSs' winning probability, winners' carbon dioxide emissions, and winning

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[1] The average power charge is computed by dividing the winning bids (yen) by the (planned) power demand (kWh). We also use it as the power charge to examine in our study and simply call it the power charge unless otherwise indicated.

[2] (Annual average) load factor is defined as follows:

$$\text{Load factor}\,(\%) = (\text{planned})\,\text{power demand}\,(\text{kW h})/[\text{contract demand}\,(\text{kW}) * 365\,(\text{days}) * 24\,(\text{h}) * \text{contract period}\,(\text{year})] * 100\,(\%).$$

Given the total power demand, lower load factor implies that capacity is more likely to be idle and thus that such customers are costly to serve.

[3] This is the authors' estimate using the model developed by ANRE (2004).

[4] More precisely, in the public procurement cases, public entities can exceptionally accept power supply from the PPSs for the sake of transparency in public procurements even if the case is out of the scope of the retail market deregulation. However, such exceptional cases tend to be small-scale contracts and thus rarely put out to bid due to the transaction costs borne by public entities.