日本電力小売全面自由化が小売価格に与える影響に関する実証研究
Empirical Analysis of the Impact of Full Liberalization Policy on Residential Power Prices in the Retail Electricity Market in Japan

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１． Introduction

The full liberalization policy in Japan's low-voltage retail electricity market in April 2016 aimed to dismantle the monopoly held by regional electricity companies, reduce barriers to entry in the low-voltage electricity market, and introduce new retail electricity suppliers to improve market efficiency and lower electricity costs for businesses and households (Defeuilley, 2009). As of October 2022, the nationwide penetration rate of new retail electricity suppliers in the residential electricity market reached 28.29%**. While some reports suggest that the full liberalization policy has led to a reduction in household electricity costs††, rigorous empirical studies examining the impact of liberalization policy on residential electricity prices are lacking. This study aims to address this research gap and provide valuable insights for policymakers.

２． Data and Identification Strategy

This study adopts the methodology proposed by Hartley, Medlock III, and Jankovska (2019) to construct a model for analyzing retail electricity prices in Japan, as shown in Figure 1. The analysis utilizes a dataset spanning 79 months from April 2016 to October 2022, covering nine distribution regions in Japan (excluding Okinawa). To measure the degree of retail electricity market liberalization, we employ the proportion of sales revenue generated by new retail electricity suppliers relative to total household electricity consumption. Regression equation (1) is used, and both fixed-effects panel regression and generalized least squares (GLS) regression are employed to address the challenges associated with a long panel dataset.

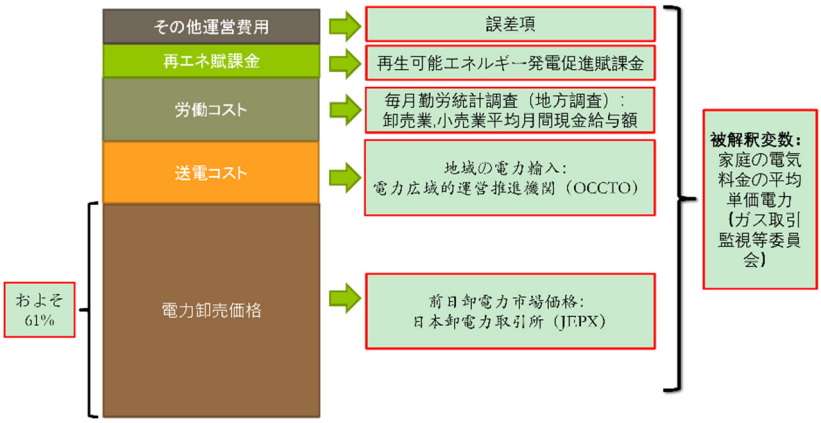

Figure 1 Analytical Framework, Proxy Variables, and Data Sources for the Costs Analysis of Retail Electricity

$$P_{it}^{Retail} = \alpha t + \gamma Share_{it}^{Liberalization} + \beta_1 P_{it}^{Wholesales} + \beta_2 C_{it}^{Transmission} + \beta_3 C_{it}^{Labor} + \lambda_i + \eta_t + \varepsilon_{it} \quad (1)$$

In the model, the primary explanatory variable is the share of new electricity suppliers, while the dependent variable is the average household retail electricity price. There exists a potential reverse causality relationship between these variables, as higher retail electricity prices may stimulate the entry of more new electricity companies, leading to an increase in the share of new electricity suppliers. To address this issue, we use an instrumental variable, namely the proportion of monthly

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** 電力・ガス取引監視等委員会(2022). "電力取引の状況(電力取引報結果)". Accessed on April 23, 2023. Available at: https://www.emsc.meti.go.jp/info/business/report/results.html.

†† 資源エネルギー庁(2022). "電力・ガス小売全面自由化の進捗状況について". Accessed on April 23, 2023. Available at: https://www.meti.go.jp/shingikai/enecho/denryoku_gas/denryoku_gas/pdf/052_03_01.pdf.

population migration from outside the region to the total household population within the region. This instrumental variable is chosen because population migration from outside the region is generally unrelated to retail electricity prices, and migrants, due to lower consumer loyalty, tend to choose new electricity suppliers as their power providers. Hence, we employ this instrumental variable to mitigate potential endogeneity concerns arising from the reverse causality relationship.

3. Results

Table 1 presents the regression outcomes using three identification methods: fixed-effects panel regression, generalized least squares (GLS) regression, and instrumental variable regression. The results obtained from these approaches exhibit minimal disparities. Based on the instrumental variable regression, a 100% share of new retail electricity companies is associated with a decrease of 3.141 JPY/kWh in retail electricity prices. Nationally, from April 2016 to October 2022, the

Table 1 Regression Results

	(1)	(2)	(3)
	Regional Retail Price (JPY/kWh) *Fixed Panel Regression*	Regional Retail Price (JPY/kWh) *GLS Regression*	Regional Retail Price (JPY/kWh) *Panel IV regression*
Share of New Power Retailers (%)	-3.431***	-3.799***	-3.141***
	(0.893)	(1.323)	(0.998)
Wholesale Price (JPY/kWh)	0.118***	0.024***	0.118***
	(0.017)	(0.007)	(0.017)
Months after Liberalization	0.041***	0.062***	0.745**
	(0.006)	(0.004)	(0.305)
Control Variables	Y	Y	Y
Month Dummy	Y	Y	Y
Region Dummy	Y	Y	Y
Samples	711	711	711
Groups	9	9	9
Adj R2	0.867		0.867

Notes: The control variables include monthly regional wind power generation output, solar power generation output, and regional electricity import volume; Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

estimated share of new retail electricity sales accounted for approximately 28.29% of household electricity consumption. Consequently, our estimates indicate that the full liberalization policy would result in a reduction of 0.889 JPY/kWh in household electricity consumption prices. However, it is evident that this effect varies across regions with different levels of new electricity supplier penetration. The Tokyo region exhibits the highest penetration rate, reaching 37.16% in October 2022. Accordingly, the liberalization policy led to a decrease of 1.285 JPY/kWh in household electricity prices in Tokyo. Conversely, for the Hokuriku region with slower growth in the share of new electricity suppliers, the reduction effect was only 0.220 JPY/kWh.

4. Conclusions and Policy Implications

The empirical findings provide evidence that the full liberalization policy introduced in Japan's retail electricity market in April 2016 has effectively reduced the financial burden on households in terms of electricity costs. However, similar to experiences in other OECD countries, the progress of implementing this liberalization policy exhibits significant regional heterogeneity. Consequently, it is crucial for future policy initiatives to prioritize strategies that promote the expansion of new electricity suppliers in these specific regions.

Major References

Defeuilley, C. (2009). Retail competition in electricity markets. Energy Policy, 37(2), 377-386.

Hartley, P. R., Medlock III, K. B., & Jankovska, O. (2019). Electricity reform and retail pricing in Texas. Energy Economics, 80, 1-11.