



Empirical Studies on Japanese Power Sector and the Environment: Market Liberalization, Decarbonization, and Innovation

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論文の要約

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論文題目

Empirical Studies on Japanese Power Sector and the Environment:
Market Liberalization, Decarbonization, and Innovation
(日本の電力部門と環境問題に関する実証研究：市場自由化、脱炭素、技術革新)

要約

The power sector is one of the world's largest emitters of carbon dioxide. Facing the climate targets of 46% carbon abatement by 2030 and carbon neutrality by 2050, the government of Japan has made numerous regulatory efforts, which have attained great attention on the effectiveness. This dissertation examines the outcomes of several environmental schemes introduced in Japan.

First, we explore the retail liberalization of the power market and test if power prices paid by residential consumers and carbon emissions from power generation changed as a result. Based on a difference-in-differences (DID) framework and data from 2012 to 2020, we found that in regions under competitive market condition, power prices are reduced by 1.48 JPY/kWh while emissions are increased by 0.69 million tons and 1.83 million tons from burning coal and natural gas, respectively. A synthetic control method (SCM) demonstrates smaller estimates compared to the DID approach. The findings suggest a tradeoff between cheaper power bills and increased carbon emissions. Policy implications are therefore twofold. On the one hand, appropriate subsidies should be provided with competitive fringes to let them enter and survive the market. On the other hand, regulating carbon emissions from incumbent power companies and developing alternative power generation technologies are needed for achieving carbon abatement.

Second, we explore the innovation impact of Tokyo-Saitama Emissions Trading System (TSETS) which imposes caps on carbon emissions and allows for the trade of carbon credits. By combining DID with propensity score matching (PSM) and using patent data of Japanese firms spanning 2006 to 2016, we found that the TSETS boosts innovations in renewable and fossil fuel technologies, with a greater impact on the latter. Furthermore, we find that firms innovating in both technology areas are more responsive than those only innovating in renewable technologies. Moreover, a stricter regulatory scheme has a greater impact on technological innovation, while it also leads to faster growth in fossil fuels than in renewable ones.

These findings suggest the potential of a regional cap-and-trade program in boosting

green innovations. However, in order to realize energy transition, policies are supposed to be designed in the way that they induce a net increase in renewable technologies.

Finally, we explore the carbon disclosure project, a voluntary environmental scheme, by examining its innovation outcomes. We also test if increases in innovations promote carbon disclosure. That is, if disclosure and innovation reinforce each other. Based on the instrumental variable (IV) method and data from 2013 to 2018, we found a positive innovation effect of carbon disclosure, while the effectiveness depends on the completeness of disclosure. Further analysis on high-emitting firms also suggests a positive innovation effect of carbon disclosure. Carbon disclosure, however, is little likely to be driven by increases in innovations. The findings suggest promoting carbon information disclosure as an alternative for boosting innovations.