

Energy efficiency investment in Japanese firms: influences of energy saving act and organizational factors

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Overview

The adoption of Paris Agreement by Governments had given substantial amount of pressure to the manufacturing and services sectors to take up initiatives to reduce emission of CO₂. One of the initiatives to combat climate change is adopting more energy efficient technology. However, the firms do not tend to invest on energy efficiency regardless of positive net present values, which is known as “Energy Efficiency Gap” (e.g. DeCanio, 1993).

It has been pointed out the existence of the gap, however, very little studies investigated what factors promote energy efficiency upgrades, especially in Japan. At the same time, investment decisions on energy efficiency may also be affected by organizational management structure. Recently, Martin et al (2012) empirically showed that a positive relationship between organizational structures and environmental practices such as investments on energy efficiency using manufacturing firm-level data of Switzerland. However, such evidences have not been observed from Japanese firms and it is our objective to contribute towards bridging this literature gap.

The Act on Rational Use of Energy in Japan was enacted in 1979 and amended in 2008, which aims at promoting energy efficiency at firm level. The law requires firms in all industries to “voluntarily improve 1% energy consumption rate per year”. However, effects of the law are unclear. So far, there is only one empirical research by Arimura and Iwata (2015) who had investigated this using the firm-level data in the hotel industry.

We conducted empirical analysis using firm-level data for all industries in Japan. Our results show that there is a strong relationship between the organizational structure and environmental practices. We also found that the Act on Rational Use of Energy promotes environmentally friendly actions by firms.

Methods

We used data from different sources in our analysis. We collected the information on management practices from surveys conducted by the Ministry of the Environment in Japan which targeted at collecting information on environmental practices from 2,676 listed companies. However, the response rate was 22%, which corresponds to 575 firms. This survey includes information about whether firms produce environmentally friendly products, total investment on office (eg. replacement of new air conditioner), divestment of emitting business, etc.

We also used economic data, such as firms turnover and industrial classification for each sample from Teikoku Databank data, collected by Teikoku databank Ltd., which is one of the famous credit research company in Japan.

For organizational structures, we used TOYO KEIZAI Japan CSR Data (CSR data), collected by Toyo Keizai Inc. This data provides the information on organizational structure of listed companies. For instance, whether the company have the department in charge of environmental practices, and other personal details about environmental manager. However, some firms were omitted from CSR data. Hence, we used environmental reports to collect information about the missing firms.

We estimated impacts of organizational structure as well as the environmental act on management practices with the following equation.

$$\begin{aligned} \text{Management_Practice}_i^* &= \beta X_i + \gamma_1 \text{Dedicated_department}_i + \gamma_2 \text{Vice_presidents}_i + \\ &\delta_1 \text{Act_on_Rational_Use_of_Energy}_i + \varepsilon_i \\ \text{Management_Practice}_i &= 1 \text{ if } \text{Management_Practice}_i^* \geq 0, \text{ otherwise } 0 \end{aligned}$$

Management_practice_i is a dummy variable denoting each environmental action taken by firm *i*. Dedicated_department_i indicates the existence of the full-time environmental department. Vice_presidents_i indicates heads of the department includes vice presidents, Act_on_Rational_Use_of_Energy_i indicates a firm is subjected to the law. X_i is a vector of other control variables including firm's turnover, industry dummies, other pressure dummies.

Results

We found a strong relationship between the organizational structures and environmental practices. If a firm has the full-time environment department, it tends to invest on new office, develop more cleaner products, design environment related products and use renewable energy. At the same time, if supervisor of the department includes vice presidents, a firm tend to withdraw from emitting business. Also, the Act on Rational Use of Energy has the positive effect on environmental practices, which means that firms affected by this law are more likely to invest both in new and old offices.

Next, we checked for heterogeneity among industries. We estimated such variables on environmental practices using firm data from the service industries. It is found that the existence of the full-time environmental department, inclusion of vice presidents to the environmental department, and Act on Rational Use of Energy have positive impacts on taking environmental actions. On the other hands, there is no or very weak impacts of these variables on environmental actions of manufacturing industry. We found only Act on Rational Use of Energy is statistically significant at 1% for investment on old offices. One possible explanation is that the cost of taking environmental action may be different among industries. Overall, organizational structure and Act on Rational Use of Energy has stronger effects on the service industry than the manufacturing industry in Japan. These results contradict with Martin et al. (2012) which has found that the organizational structure has strong impacts on the manufacturing industry in Switzerland.

Conclusions

In this paper, we explored effects of the organizational structure and Act on Rational Use of Energy on environmental action using firm-level data in Japan. We found both promotes firms to take environmental actions, however, the effect varies between the service and the manufacturing sector. These results are based on cross sectional analysis and we interpreted the causal effect in presence of unobserved factors that we failed to control for in our model. Another limitation of this study is that there would be endogeneous variables.

References

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