

Environmental Behavior and Its Relationship with Economic and Environmental Performance in Japanese Firms

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Abstract

Sustainability became a key word for economies and firms since 1990s. Firms began to pursue the course which can balance environment and economy. But, environmental management is still a huge challenge, and we cannot provide clear and logical path about how to achieve it. This article examines the environmental behavior of Japanese firms, and analyses how the behavior relates to economic and environmental performance. We investigate the causal relationship between factors with showing the organizational mechanisms to improve environmental performance. Structural equation modeling is used to analyze processes in environmental behavior. Our finding indicates that environmental strategy plays an important role in striking a balance between environment and economy. The result of analysis cannot confirm the Porter hypothesis regarding process of environmental innovation and performance. To encourage firms to build an adequate strategy for environmental management, government plays a big role in creating infrastructure in the market and society.

Keywords: environmental behavior, eco efficiency, causality, performance, Porter hypothesis

1. Introduction

It has been more than 20 years since the broader discussion on sustainable development started. In 1987, the UN “World Commission on Environment and Development” report presented the fundamental principles of sustainable development (WCED 1987). During the Earth Summit (UN Conference on Environment and Development) in 1992, governments agreed with concepts of

sustainable development, contained in the Agenda 21. In 1997, the Kyoto Protocol was signed to combat climate change and reduce greenhouse gas emissions.

With the development of this social and economic framework, firms gradually made efforts to reduce their environmental burden (Schmidheiny with BCSD 1992, DeSimone and Popoff 1997). Environmental measures such as 3R (reduce, reuse, recycling), acquisition of ISO14001 certification, green procurement, Life Cycle Assessment (LCA), Design for Environment (DfE), efforts in reducing CO₂ emissions and other activities, have been introduced. “Changing Course” by Schmidheiny with BCSD (1992) advocates a paradigm shift in management wherein firms can enhance environmental behavior while increasing economic output. In 1991, Nihon Keidanren (Japan Federation of Economic Organizations) published the Keidanren Global Environment Charter. It mentioned that “Tackling with environmental problems is essential to one’s own existence and activities.” Now, the promotion of environmental activities is still a huge challenge, and even policymakers and firms cannot provide clear and logical directions about how to achieve it.

There is still no common understanding of the kind of behavior that should be encouraged in order to achieve a sustainable balance between economy and environment. In order to achieve a sustainable society, it is necessary to understand the organizational mechanisms in the simultaneous pursuit of economic and environmental performance, while formulating appropriate government policies.

This article examines the environmental behavior of Japanese firms, and how this behavior relates to economic-and environmental performance. Structural equation modeling is used in analyzing processes in environmental behavior. We investigate the causal relationship between factors with showing the organizational mechanisms to improve environmental performance.

2. Literature review

This section discusses previous research on the relationship between environment and economy. In terms of research focus, previous studies can be divided into three groups. The first group examines the relationship between environmental regulations and environmental performance. Porter suggested that properly designed environmental regulations can encourage technological development, then promote firms' environmental activities and can enhance environmental performance (Porter 1991, Porter and v.d., Linde 1995). Thus, it is regarded that technological development and improvement in resource productivity can increase firms' competitiveness and will enhance their economic performance. Policy decision such as environmental taxation is one of the main issues.

The second body of literature analyses the relationship between economic performance and environmental performance. Empirical studies have tried to assess whether a balanced relationship can exist between environmental and economic performance (Russo and Fouts 1997, Hart and Ahuja 1996, Wagner et al. 2002). This has been the focus of Porter hypothesis. Some researchers argue that there is no positive relationship between environmental and economic performance (Walley and Whitehead, 1994) or that it may occur only under specific conditions (Rugman and Verbeke, 1998, Palmer et al 1995). Multiple regression analysis was used to examine the relationship; research findings in the USA (Hart and Ahuja 1996, Konar and Cohen 1997, Russo and Fouts 1997, Corderio and Sarkis 1997), UK (Thomas 2001), Germany (Wagner et al. 2002), and Japan (Kimbara and Kaneko 2005, Nakao, et al., 2007) were presented.

The third category of existing literature focuses on the environmental efforts and practices that can improve economic performance. For this purpose, it is useful to apply a resource-based view that regards organizational capabilities as

a driving force of performance (Barney 1991, Aragón-Correa and Sharma 2003). DeSimone and Popoff (1997), Florida (1996), and Shrivastava (1995) discuss whether a proactive environmental strategy can enhance economic performance. There is also research findings that Total Quality Management (TQM) and participatory management can increase environmental performance (Shrivastava 1995). Green supply chains and Environmental Management System (EMS) have also been emphasized (Schaltegger and Synnestvedt 2002). Environmental information disclosure increasingly becomes necessary. Corporate social responsibility is required as one of conditions for sustainable development (Al-Tuwaijri et al. 2004).

We have conducted our analysis on the environmental behavior of Japanese manufacturing firms and found two important facts (Kimbara and Kaneko, 2005). First, the study shows the significant positive relationship between environmental performance and economic performance. The study uses an eco-efficiency variable based on CO₂ emissions to measure environmental performance. As far as we know, it is a first paper which used CO₂ emission as an environmental performance indicator. Second, the study indicates the path dependency of environmental practices and management. Practices such as ISO14001, environmental accounting and Design for Environment were achieved more in large firms than small firms, following a certain development path. Evidence indicates that more resources and organizational capabilities were obtained when firms grow.

In terms of performance, many studies have been done in the past decade to investigate the relationship between economy and environment, but most of studies have not explained the causal relationship in environmental management. Using the data from the survey of Japanese manufacturing firms, this paper shows the organizational mechanism between environmental behavior and performance. In order to support our argument, we start with a case analysis on

environmental activities and economic effect.

3. Facts from environmental accounting

Schmidheiny with BCSD (1992), DeSimone-Popoff (1997), Porter and v. d. Linde (1995), and Florida (1996) provided examples of companies that have reduced their environmental burden while ensuring economic effectiveness. We recognized the kinds of environmental practices involved in the cases, but they did not show the process as a generalized pattern and did not indicate causal relationship among factors. They did, however, provide examples where environmental efforts increased competitive advantage and led to increased sales and cost reduction.

Like Global Reporting Initiative, the environmental accounting guidelines of the Ministry of Environment of Japan require firms to conduct an evaluation of environmental costs and economic effects. Leading firms follow these guidelines and disclose the results of environmental management. Here we take Fuji Xerox as an example. Fuji Xerox implemented green procurement and product recycling, and reported a profit in recycling activities (Fuji Xerox, Sustainability Report 2004). The company disclosed a deficit of 2.89 billion yen in 1999, 800 million yen in 2001 but was out of the red in 2003 with 60 million yen in profits, and 130 million yen in profit in 2005. Profits from recycling system have been steadily increasing since 2003.

The first reason for this gain was the increase in the recycling rate of parts. Distributor companies achieved a collecting rate of 89 percent for copiers in 2000. A second reason for the gain was the company's increase in the reuse of parts. They have achieved a 58 percent reuse rate for copier parts. The third reason was the company's streamlining of its distribution and logistics processes, and the fourth was the increase of efficiency in the cleaning process through streamlining of processes and automation.

The mechanism which achieved the environmental and economic performance simultaneously can be summarized as follows. Through reuse and recycling of machine parts, the volume of virgin resources was reduced and resulted in energy savings and a reduction of CO₂ production in the manufacturing process. As a result of these environmental efforts environmental cost was reduced, while environmental efficiency increased, so that overall there was an economic gain. These activities have reflected the company's clear policy toward corporate social responsibility.

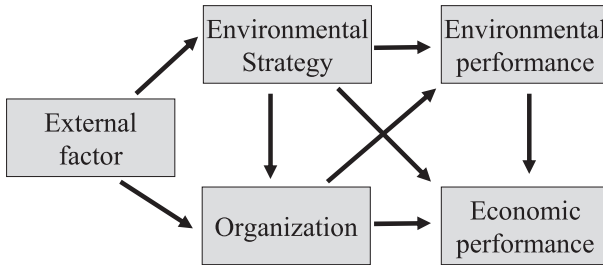
At Fuji Xerox, with increasing importance of environmental issues, top management recognized issues as a matter of corporate social responsibility. They adopted company's vision and policy for sustainability. It then stimulated R&D function, process and business system to adapt to sustainable system. The goal of policy was shared by organization members at operative activities and improved environmental performance.

4. Research Framework

This paper analyzes the causal relationship between behavior and performance of Japanese manufacturing companies. The framework of this analysis is shown in Figure 1 below. This is composed of 1) external factor, 2) firm factor of environmental strategy and organization, and 3) performance factor. Performance includes environmental and economic performance. In this framework, external environment, organizational process, and organizational activity result are assumed as causal processes.

For example, when government regulation on emission of hazardous chemicals are strengthened, the risk of business increases so that firms take action to reduce risks. Social responsibility investment (SRI) in the stock market enhances environmental efforts that can increase market value of the firm. So, organizational behavior on environmental conservation and environmental

Fig. 1 Framework of Analysis



strategy will be enhanced. These factors in Figure1 are treated as latent variables in the structural equation modeling. The latent variables are not directly measured, but depend on observable variables.

The causal relationship between factors are generally interactive. First, the relationship between strategy and organization was discussed by researchers since Chandler (1962) showed the proposition that structures follows strategy. It is, however, pointed out there are opposite impact from organization to strategy (Burgelman 1983). Causal influence of economic performance to environmental performance, strategy and market is as well expected. However, the causal process of the framework in this paper shows main effect empirically. Most of preceding studies to examine the relationship between environment and economy use economic performance as a dependent variable and environmental performance as an independent variable. Organization needs to follow strategy to achieve goal specified in the strategic plan. Also, firms adapt to market and regulation. Even though we admit the importance of two way causal influence in dynamic economy, in this paper we assume the causal relationship shown in Figure 1.

5. Data

1) Data source

For the analysis of environmental management practices, we used the responses from the structured questionnaire in the survey conducted in 2004. Answers of questionnaire indicate the facts as of 2003 activities of each firm. The responses are obtained through a manager of environmental management in each firm. In structural equation modeling, perception data of environmental activities are often used. Behavior and decision making in the organization reflect the perception of issues.

Answers in the survey questionnaire are measured by a 5-point Likert scale. However, in organizational indicators of environmental management, (environment report, ISO 14001 certification, environmental accounting), three evaluation points were used to describe the status of indicators whether it is in (i) implementing stage of formulation; (ii) in the preparation stage, or (iii) no plans to introduce or to formulate.

Nikkei NEEDS financial data from 2003 have been used for financial data, while for environmental ranking, the data came from Nihon Keizai Shimbun's 7th Environmental Management Survey in 2003. For environmental efficiency, the CO₂ data were obtained from the environment reports of each company in 2003. Eco-efficiency is shown by sales/CO₂. The total number of samples used in the analysis was 172 firms.

2) Variables

Questionnaire was designed to indicate variables and components, based on factors preceding studies in the field of strategy and organization used in their researches. First, external factors consist of three indicators: (1) government regulation and guideline on environmental measures (2) requests from the

community and (3) requests from customers. These three are significant factors when we think the impact of external factors. Second, environmental strategies consist of the following indicators: (1) environmental measures as a priority of corporate management, (2) top leadership, (3) environmental management responsible person's influence, and (4) employee participation. Another indicator is the market response indicator which includes (5) response to requests from customers fro eco product/process.

The third set of indicators are those that pertain to the organization: (1) environmental measures and activities in the production process, (2) environment-oriented product development and design activities, (3) recycling of waste products and other recycling activities, (4) environment report, (5) ISO14001 certification, and (6) introduction of environmental accounting. The first three indicators are related to the technological level of environmental measures and the last three refer to environmental management system of the organization.

In investigating the relationship between environmental strategy/organization and performance, we divide performance into two categories: environmental performance and economic performance. Environmental performance includes: (1) environmental efficiency (= sales/CO₂), (2) environmental ranking by NIKKEI, (3) comparison with other companies in the same industry in terms of water pollution control efforts, (4) comparison with companies in air pollution control efforts and (5) comparison with companies in CO₂ reduction efforts.

Many firms use environmental efficiency as an environmental performance indicator. This efficiency often indicates a substantial decrease of environmental burden in manufacturing firms. But, there are constraints on how to precisely measure environmental effects because of the diversity of impacts.

Indicators for economic performance include (1) return on assets, and (2) growth rate of sales. Adding to these indicators, three customer satisfaction

indicators are used, (3) customers' claims (in inverse), (4) cooperation with customers in problem solving and (5) stability of relations with customers. With the data discussed above, we have conducted an analysis. Figure 2 shows the results of the analysis, and standardized path coefficients are indicated.

6. Results of analysis

First, there is a significant positive relationship between external factor and environmental strategy (coefficient 0.40, 1% significance level). External factors include pressure from government, community, and customers. The strong association here reflects an increase in social responsibility awareness. However, external factor is not significantly related to an organization's environmental behavior having a negative coefficient (-0.07). Consequently, we cannot say that there is a significant relationship between external factor and organization's environmental behavior. Considering the results of our analysis, a significant relationship between external factor such as government environmental regulation and organization's environmental behavior cannot be shown. In terms of environmental regulations from government, we cannot see a positive relationship with organizational environmental behavior. Results from the analysis and causal relationship cannot support Porter hypothesis as the process of increasing environmental performance.

We can point out several reasons for the negative relationship between external factor and organization. One is that there would be the evasive behavior of firms to conduct activities in reducing environmental burden because of the cost increase. This tendency can be often seen in small and medium scale enterprises (SMEs) and in developing countries. Such difficulty with environmental management in SMEs is already pointed out by preceding studies. The second possible reason is that companies might adopt environmental strategies not only because of perceived external pressures but as

part of proactive and innovative activities. These behaviors can be observed from proactive multinational companies (DeSimone and Popoff 1997). Environmental behavior can improve chances for innovation, which will lead to increased competitiveness. So, the importance of external pressure is perceived to be relatively weak for these companies.

A third reason is the time lag between firm action and external pressures such as government regulations. Generally, firms need technological capabilities and financial resources to respond to external pressures, and strengthening their

Table 1. Path coefficient of latent variable

External factor	→ strong request on environment from administration	0.886	—
	→ strong request on environment from community	0.883	***
	→ strong request on environment from customer	0.331	***
Environmental strategy	→ Leadership by top management on environmental issue	0.803	—
	→ Consciousness on environment by employee is high	0.720	***
	→ Person in charge of environment has strong voice	0.738	***
	→ Company has responded to requests for eco product/process	0.585	***
Organization	→ Environmental consideration has priority in business.	0.553	***
	→ Environmental report publish	0.534	***
	→ Environmental account	0.532	***
	→ ISO14001	0.525	***
	→ Environmental effort in the manufacturing process.	0.630	—
	→ Environment-oriented product design and development.	0.558	***
Environmental performance	→ Reuse and recycle of waste.	0.689	***
	→ environmental efficiency	-0.074	***
	→ environmental ranking	0.309	***
	→ Environmental effort to decrease water pollution.	0.871	***
	→ Environmental effort to decrease air pollution.	0.953	—
Economical performance	→ Environmental effort to decrease CO ₂ .	0.682	***
	→ Return on asset	0.090	
	→ Increased revenue ratio (5 years average)	0.090	
	→ There are a little claims from customers	0.357	***
	→ Company cooperates with customers to solve problems	0.554	—
	→ Relationship with customer is stable	0.589	***
CFI = 0.720	$\chi^2 = 657.729$ (df = 244)	P = 0.000	

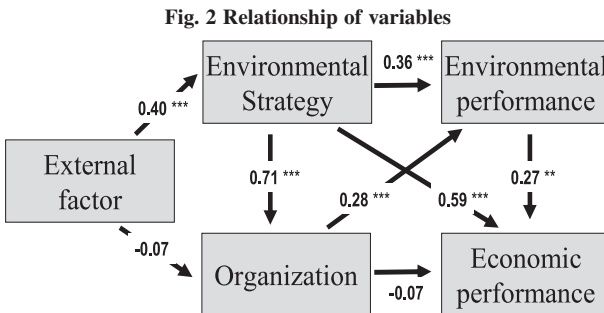
* significant at 10%; ** significant at 5%; *** significant at 1%

behavior may not always be possible in the short-term.

This would mean that environmental regulations do not necessarily promote environmental behavior. For the firms with proactive environmental strategies, regulations are not strongly perceived as a main reason of practices.

Second, there is a significant relationship between environmental strategy and environmental performance, and between environmental strategy and economic performance. Environmental strategy also has a significant relationship to an organization's environmental efforts (coefficient 0.71, 1% significance level). In order for the firm to make substantial change in environmental behavior, it is important to clarify its strategy or policy toward the environment. When top management plays a role in formulating environmental strategy as in the case of Fuji Xerox, it stimulates increased environmental management behavior and participatory efforts. This result shows that strengthening environmental behavior is a mechanism to achieve a concrete environmental performance.

Third, if activities such as environmental management systems (EMS) and other organizational practices are strengthened, environmental performance shows a positive significant relationship (coefficient 0.28, 5% significance level), but economic performance is not significant with a weak negative sign (coefficient -0.07). In other words, although environmental practices can enhance environmental performance, they will not necessarily be positive for



economic performance directly. We cannot conclude that efforts toward the environment always increase the economic performance of a business.

7. Discussion

Based on the aforementioned results, the theoretical importance of the study becomes evident. First, the environmental strategies of firms play an important role in striking a balance between environment and economy. Thus, if environmental strategies are proactive, it would be easier to maintain a positive effect on environmental performance and economic performance. This means that it is important for companies to clarify their environmental strategy. Consequently, in order to improve environmental performance, it is necessary to strengthen environmental strategies. Through improved environmental strategies, we can expect that organizational efforts will be improved. Therefore, we need to emphasize the process of performance improvement to attain the direct relationship between environmental strategy and environmental and economic performance.

Second, failure to establish appropriate environmental strategies shows that organization's environmental efforts are weak and ineffective. When government environmental regulations require organization's environmental measures such as certain equipments with specified technology, the organization will easily become passive. It has been shown in environmental management theory that firms lean toward reactive approaches without economic benefits (Rugman and Verbeke 1998). If incentives are weak for firms, it would be unrealistic to expect them to persist in their environmental efforts. When the organization's environmental objectives and policies are clearly identified, the organization's initiatives are strengthened. In addition, when environmental strategies can promote organization's environmental activities, we can also expect that it should bring positive environment performance.

In other words, an organization's environmental behavior on a strategic level should incorporate top leadership and strategic objectives. It is not necessarily appropriate to require firms to achieve the strict environmental criteria by using end-of-pipe type technologies.

Third, our analysis shows important finding in relation to the Porter hypothesis. The hypothesis states that properly designed environmental regulation which can promote development and innovation of environmental technology in the organization is important not only to achieve environmental performance but to increase resource productivity and strengthen cost competitiveness as a reflection of competitive superiority, and enhance economic performance.

We can show some points based on the results of our analysis. (1) External factor has a negative relationship with organization factor including ISO14001, R&D function, various measures in production process to reduce the environmental impact. It may not be able to influence the organization's environment innovation, (2) We cannot conclude that organization's environmental behavior can improve economic performance, (3) Environmental behavior with proper environmental strategy will increase environmental performance and enhanced environmental will increase economic performance.

Fourth, previous studies emphasized path dependence in environmental management (Florida, 1996, Aragón-Correa and Sharma, 2003). Organizations' resources and capabilities are usually the basis of strategy and competitive advantage. Firms go through the steps of development of environmental management.

From the results of our analysis, we cannot confirm the Porter hypothesis regarding the organizational process which achieves environmental performance as well as economic performance. In contrast with the process mentioned by Porter, behavior defined by policy and environmental strategy is important to

help balance environment and economy. High environmental consciousness in society and in the market can guide a firm's policy and responses to external factors. Especially, government plays a big role in infrastructure development to encourage environmental behavior among firms.

8. Conclusion

In order to determine the nature of the relationship which exists among environmental behaviors, external pressures, and environmental performance and economic performance, a causality framework has been shown in this paper. We showed the causal process to promote a simultaneous/balanced environment and economy. This mechanism can provide theoretical support to promote a firm's environmental practices for a sustainable society.

Further research would involve refinement of indicators and relationship of variables. We need to investigate the differences between environmental efforts of firms in developing countries as well as in developed countries. From such an analysis we can elaborate this causal relationship in relation to the stages of economic development. Based on the individual stages of economic development, we can adopt effective measures and behaviors for sustainable development.

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