# Determinants of Environmental Management Transfer by Japanese Firms in Vietnam

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**Abstract**

To achieve sustainable development, it is necessary for multinational enterprises (MNEs) to transfer their environmental practices and technologies to developing countries. With our concern about environmental management transfers, we collected data from 96 subsidiaries in a questionnaire survey conducted in early 2010 in Vietnam. Government regulation, environmental strategy, organization and environmental performance are key factors in an analytical framework that depends on resource-based view. A multi-regression method was used for analysis. We found that ISO14001 and green purchasing in parent firms are positively related to the international transfer of these practices. The results also suggest path dependency in international transfer of environmental practices. It should be emphasized that firms increasingly recognize environmental practices as sources of competitive advantage.

**Keywords:** Environmental management, Transfer, Determinant, Vietnam, Japanese firms

## 1. Introduction

Globalization of the economy intensifies open, borderless competition. This globalization incurs the internationalization of environmental management since the success of business partly depends on environmental management to respond to environmental regulations and world awareness of global environmental issues. In order to realize sustainable development, multinational enterprises (MNEs) with a global supply chain must address environmental preservation. In these circumstances, the role of MNEs, which operate globally, is quite large.

A new issue, theoretically and practically, is to clarify how MNEs transfer practices of environmental management to overseas operations. The focus of this paper is the transfer and diffusion of environmental management practices beyond national boundary. We define environmental management as the process of economic activities to pursue economic values as well as reducing environmental burden.

Firms address the transfer of environmental management to overseas subsidiaries and other organizations, such as suppliers, for three reasons. First, firms are required to reduce environmental burden in order to contribute to sustainable development under the increasing awareness of the global environment. It is now regarded as corporate social responsibility to pursue economic activities that are benign to the Earth (Elkington, 1994). In this sense, firms need to show accountability in their activities.

Second, with the enactment of the Restriction of Hazardous Substances (RoHS), Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) and End of Life Vehicles (ELV) directive, the regulation of hazardous chemicals has been intensified. MNEs need to adapt to these regulations. This adaptation should include the MNE supply chain since without suppliers, assembly firms have a potential risk of containing hazardous chemicals in their products. Thus, MNEs need to adopt a global environmental management system to implement green supply chain management.

Third, environmental management is an important source of competitive advantage in market competition. In an individual case such as 3M (Shrivastaba, 1995), there are obvious effects on financial performance from the innovation of new products and process technology with less environmental impact. Emphasis on environmental

innovation, therefore, tends to shift from end-of-pipe technology to new product or new energy developments (Beise & Rennings, 2005). In addition, environmental practices that improve eco-efficiency become necessary conditions to continue business with large firms for small firms in fields where green purchasing is implemented. Economic success is increasingly combined with environmental practices for sustainability (Porter & van der Linde, 1995).

This paper examines how environmental practices are transferred to overseas operations. We analyze these issues based on the data collected in a questionnaire survey from Japanese-related firms in Vietnam. In 1986 Vietnam changed policy to adopt market economy with the Doi Moi reforms and began to open the economy to foreign investment. At present, Vietnam receives large scale investments from Singapore, Netherlands, Japan, Korea, the US and the UK. The growth rate of the Vietnamese economy from 2000 to 2011 was 7.11% on average.

The next section reviews preceding studies in environmental management transfer. The third section discusses the methodology and data used in this study, and the fourth section analyzes the determinants of the transfer of environmental management practices. The fifth section summarizes the findings.

## 2. Literature Review

### *2.1 International transfer model*

A number of theories have been developed to explain why firms make foreign direct investment. Among theories, the internalization theory (Buckley & Casson, 1976) and the eclectic theory (Dunning, 1988) have laid the groundwork for our examination of the determinants of environmental transfer. These theories explain why firms make investment by focusing on competitive advantage. Recent studies examine the transfer of knowledge and capabilities of MNEs (Gupta and Govindarajan,2000; Pèrez-Nordtvedt et al..2008; Fang et al., 2010).

Jeppesen and Hansen (2004) summarized a number of approaches to developing countries enhancing the ability of their firms by building linkages with MNEs. First, the commodity chain approach indicates that products as a commodity is controlled through power balance between MNEs and developing countries. Second, the industrial organization approach explains market competition based on the five forces model proposed by Porter (1980). Third, the transaction cost approach explains the effect of transaction cost. Fourth, the resource-based approach explains that direct investment is the most effective means to transfer resources and capabilities to overseas operations. The transfer then generates competitive advantage.

Of these approaches, the industrial organization approach argues that five market forces define strategy. The transfer of environmental management to developing countries will build first mover advantage to firms, and second, it in turn provides competitive advantage to suppliers as well (Jeppesen & Hansen, 2004). In contrast, the resource-based approach argues that resources and capabilities are the basis of growth and performance (Barney, 1991; Rugman & Verbeke, 1998). Firms gain sustainable competitive advantage when the strategy is supported by organizational capabilities (Hart, 1995). Here, organizational capabilities are defined as the ability to create new products, technology, services or business systems by integrating organizational activities and resources. The resource-based approach points out that subsidiary operations swiftly obtain necessary capabilities to address environmental issues through the transfer of practices from the parent firm. It is effective to save input resources and to decrease environmental risk by implementing green purchasing.

### *2.2 Transfer of environmental capabilities*

With this understanding, we define environmental capability as the organizational, technological and institutional ability to reduce environmental burden. The definition implies the ability to reduce environmental impact at the level of process, product and business system. As environmental issues have a number of aspects, the transfer of environmental management to an overseas operation is implemented in varied ways and practices. The transfer covers various stages within the production department, interdepartmental activity within a firm, and supply chain of inter-firm activities (Esty & Porter, 1998).

In fact, firms transfer many practices such as machinery, equipment, technology, know-how, policy, rules, procedure, ISO14001 system, green purchasing guidelines, environmental reports, life cycle analysis (LCA), and environmental accounting. These practices are classified into managerial activity such as ISO14001, green purchasing, environmental accounting and technological activity such as environmental technology, eco-design, recycling, and reduce, reuse and recycle (3R), among other activities.

### *2.3 Determinants of international transfer*

Three factors are the focus in the preceding studies of international transfer of management or technology. Jeppesen and Hansen (2004) examine government regulations, market and internal resources/environmental strategy. The

absorptive capacity of host countries is often emphasized in the technology and knowledge transfer in MNEs (Cohen & Levinthal, 1990; Gupta & Govindarajan, 2000). Absorptive capacity is the ability to recognize the value of new information and absorb and apply this new information to a commercial purpose. This capacity is the ability of a firm, society, or individual to adopt new technology or skill that includes technological capability, knowledge, skill and supporting system. We refer here to government regulation, market/customer, and environmental strategy of firms since it seems to be appropriate when we focus our attention on the practices of overseas operations of MNEs.

The first is external factors such as government, market, and consumers. Government is a key stakeholder that brings regulation to corporate activities (Henrique & Sadorsky, 1996). Regulations such as RoHS, REACH and ELV for controlling chemical substances strengthened green purchasing in the whole process of the supply chain. Such environmental regulations are reflected in market needs and customer demands.

The second factor is the environmental strategy of MNEs that operates internationally. MNEs are substantial actors that transfer environmental practices overseas. Environmental strategy plays a key role in environmental management; it determines investment decisions and defines corporate resource allocations. Thus, the environmental practice of foreign operations is defined by corporate environmental strategy. A foreign subsidiary is internalized as part of an MNE group, but the strategy of the MNE and the strategy of its subsidiary are not necessarily the same.

The third factor is market and customers. Environmental regulation is reflected in market needs. Consumer goods manufacturers cannot continue their businesses without satisfying the legally set criteria and adapting to market needs. Industrial goods manufacturers in turn have to meet market needs through customers. Adaptation to customer demand is critical in the sense of determining financial performance.

Supply chain management is intensifying in environmental practices. Green supply chain management becomes obvious in the following three aspects. First, firms are required to contribute to the reduction of greenhouse gas (GHG). Several countries such as Netherlands and Sweden adopted policy in the early 1990s to levy taxes on the consumption of energy or $CO_2$ emission. Firms need to reduce $CO_2$ emission in the whole supply chain. As the reduction of GHG becomes a common goal, firms pursue reducing $CO_2$ emissions through decreasing material input, energy input and product weight. Thus carbon supply chain management by individual firms has already started.

Second, green purchasing and chemical substance management have intensified. The earth summit in Johannesburg in 2002 agreed that until 2020, we minimize the harmful influence on human health and environment caused by the manufacturing and use of chemical substances. Under the circumstances, regulations about hazardous chemicals in automobiles were strengthened as electric and electronic products.

Third, environmental issues have become an important factor in competition. For example, most global assemblers use or encourage their suppliers to obtain ISO14001 certification. Building an environmental management system and a chemical management system are necessary for MNEs to control environmentally harmful substances and avoid risk in the entire supply chain. Environmental management actually becomes a source of competitive advantage in terms of efficiency and organizational capabilities (Aragón-Correa and Sharma ,2003)

Yet many points require clarification: what factors work in which conditions, what relationships exist among factors, and how the transfer of practices will be done using which route. We next empirically examine the determinants of transfer of environmental practices and procedures from the MNE parent firm to the overseas subsidiary.

## 3. Research method

### *3.1 Analytical framework*

In order to analyze the determinants of transfer of environmental practices, we created an analytical framework that consists of external factors, strategy, organization, and environmental performance. This framework was developed from the contingency model, which is often used in management studies. We then examined the determinants of environmental management transfer based on this framework. Following Henrique and Sadorsky (1996) and others, there are several external stakeholders. In this study, we adopted three external factors: government regulation (GOV), demand by local community (COM), and customer /market demand (CUS).

Cohen and Levinthal (1990) and other preceding studies often pointed out that strategy is one of the main factors that determines the transfer of management. Environmental strategy is a guideline that combines various resources and activities and sets the direction of how firms proceed. Environmental strategy is the business framework for integrating resources and activities. When the strategy is clear, what to achieve and how to implement become clear for the members of an organization. Such strategy also contributes to motivating members. In this paper, we develop two indicators to measure environmental strategy: top leadership (LDS) and goal (GOAL).

Organizational factors can be classified into either managerial practices or technological practices. Managerial practices are the managerial program or practices, such as green purchasing and the environmental management system, and technological practices are those behaviors that reduce environmental burden. Technological practices relate to greening of production and products. For the analysis of determinants of transfer, we measure the adoption of green purchasing (PGREN) by the parent company as the reduction of environmental impact is related to the greening of production process. The managerial aspect is measured by the parent company's ISO14001 certificate (PISO), which controls the strategy and operational activity of subsidiary firms. Parent company policies and practices should influence subsidiary activities.

The environmental practices of subsidiary firms in Vietnam are measured by ISO14001 (ISO) and green purchasing (GREN) as are those of the parent company. The environmental performance indicator is typically greenhouse gas (GHG), chemical substances, solid waste, and $CO_2$/energy (WBCSD, 2000). However, there is some difficulty integrating different indicators. In this paper, we use a Likert type scale to measure environmental performance in terms of perception data in that the availability of objective data such as eco-efficiency and Toxics Release Inventory (TRI) is limited in Vietnam. Consequently, we use environmental performance indicators of water pollution (WPER), air pollution (APER), $CO_2$ (CO2PER), and solid waste (WSTPER).

*3.2 Data*

We prepared a semi-structured questionnaire based on the framework discussed in the previous section. Our focus of analysis was Japanese-related firms in Vietnam. Data was obtained through interviews conducted by Vietnamese assistant researchers. The researchers visited firms in Hanoi and the Ho Chi Minh area and interviewed company directors or the person in charge of environmental management. The questionnaire survey was conducted from January to March 2011. From the several sources of list of firms, we contacted 400 firms in the manufacturing sector and obtained 96 responses from those 400 firms. They are manufacturing firms that produce products or intermediate goods.

For the size of firms measured by the number of employees, 41 firms (42.7%) had 1 to 299 employees, 35 firms (36.5%) had 300 to 999 employees, and 20 (20.8%) had more than 1,000 employees. Data was obtained by Likert type 5 points scale with a few exceptions: strongly agree = 5 and strongly disagree = 1. Questions about ISO14001, environmental reports, and environmental accounting were measured by 3 grade points: adopted = 3, preparing = 1, not = 1. The ownership of the parent firm (JOWN) was measured by the ownership ratio (%).

Table 1. Descriptive statistics

| Variable | | Mean | SD |
|---|---|---|---|
| External factor | GOV | 3.777 | (0.819) |
| | COM | 3.095 | (1.203) |
| | CUS | 3.978 | (0.926) |
| Environmental strategy | LDS | 4.033 | (0.702) |
| | GOAL | 4.083 | (0.790) |
| Organization | PISO | 2.683 | (0.701) |
| | PGREN | 3.793 | (0.857) |
| | JOWN | 95.070 | (15.325) |
| Management system | ISO | 2.394 | (0.832) |
| | GREN | 3.185 | (1.074) |
| Environmental performance | WPER | 4.064 | (0.653) |
| | APER | 4.130 | (0.633) |
| | CO2PER | 3.886 | (0.915) |
| | WSTPER | 3.948 | (0.671) |

Government regulation (GOV) measures the degree to which government environmental policy and regulation are strict. Community pressure (COM) is the degree to which the local community requests strict environmental standards. Customer/market pressure (CUS) is the degree to which customer request is strict.

Top leadership for environmental management (LDS) means the degree to which top leadership plays a critical role in environmental issues. The goal of environmental achievement (GOAL) indicates the degree to which a subsidiary aims to reduce environmental impact.

Green purchasing by parent firms (PGREN) means the degree to which parent firms implement green purchasing. ISO14001 of the parent firm (PISO) indicates if the parent firm has ISO14001 certification. Ownership ratio (JOWN) measured the degree of ownership control.

For organizational commitment by the subsidiary firm, green purchasing was measured by the score in the similarity of its green purchasing to that of the parent company. Then, ISO was measured by the adoption of ISO14001. Four indicators were used for environmental performance: water pollution (WPER), air pollution (APER), $CO_2$ reduction (CO2PER), and waste (WSTPER). WPER means that the level of waste water treatment in the subsidiary is good. APER means that the level of air emission reduction in the subsidiary is good. CO2PER implies that the subsidiary is actively reducing $CO_2$ emission. WSTPER means that the level of solid waste emission reduction in the subsidiary is good.

## 4. Results of analysis

### *4.1 Managerial and technological transfer*

We built an analytical model with ISO14001 and GREN as the dependent variable, and external factors (GOV, COM, CUS), strategy (LDS or GOAL) and organizational factors (JOWN, PISO, PGREN) as independent variables as shown in Model 1 and Model 2. The ordinary least squares (OLS) method was used for estimation. As the correlation between LDS and GOAL was high ($r=0.527$, $p<0.01$), we estimated by separately using LDS or GOAL. The dummy variable indicates 0 when the number of employees is less than 299 and 1 more than 300.

Model 1:

$$ISO=\beta_{i1}GOV+\beta_{i2}COM+\beta_{i3}CUS+\beta_{i4}LDS(\text{or GOAL})+\beta_{i5}JOWN+\beta_{i6}PISO+\beta_{i7}Dummy \quad (1)$$

Model 2:

$$GREN=\beta_{g1}GOV+\beta_{g2}COM+\beta_{g3}CUS+\beta_{g4}LDS(\text{or GOAL})+\beta_{g5}JOWN+\beta_{g6}PGREN+\beta_{g7}Dummy \quad (2)$$

The results of the analysis shown in Table 2 indicate that PISO, ISO14001 and size of firm are significantly positive. Top leadership (LDS) was not significant, but GOAL and JOWN were significantly positive with the transfer of environmental practices to subsidiary firms. For green purchasing, only PGREN was significantly positive.

From these results, we conclude that the environmental practices of an overseas subsidiary are largely determined by parent firm practices. The results indicate that when parent firms are committed to environmental management, the commitment tends to be transferred to foreign subsidiaries. When parent firms implement ISO14001 management, the commitment is likely to be transferred to overseas operations. When green purchasing is practiced, green purchasing transfers to subsidiary firms.

Table 2. Results of analysis (ISO, GREN)

| | Model1(ISO) | | | | | Model2(GREN) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | tvalue | | Coefficient | tvalue | | Coefficient | tvalue | | Coefficient | tvalue |
| GOV | 0.080 | 0.682 | | 0.032 | 0.299 | GOV | -0.301 | -1.939 | | -0.285 | -1.814 |
| COM | 0.070 | 0.641 | | 0.103 | 1.008 | COM | 0.243 | 1.534 | | 0.242 | 1.540 |
| CUS | -0.129 | -1.310 | | -0.184 | -1.981 | CUS | -0.067 | -0.494 | | -0.068 | -0.505 |
| JOWN | 0.180 | 1.781 | | 0.203 | 2.175 * | JOWN | 0.163 | 1.230 | | 0.077 | 0.591 |
| LDS | 0.156 | 1.527 | | | | LDS | 0.158 | 1.155 | | | |
| GOAL | | | | 0.309 | 3.107 ** | GOAL | | | | -0.031 | -0.207 |
| PISO | 0.547 | 5.681 ** | | 0.542 | 6.129 ** | PGREN | 0.323 | 2.252 * | | 0.386 | 2.796 ** |
| Dummy(scale) | 0.300 | 3.171 ** | | 0.246 | 2.734 ** | Dummy(scale) | 0.004 | 0.033 | | 0.032 | 0.236 |
| Constant | -1.181 | -1.278 | | -1.451 | -1.820 | Constant | 0.528 | 0.312 | | 2.036 | 1.369 |
| $AdjR^2$ | | 0.436 | | | 0.494 | $AdjR^2$ | | 0.136 | | | 0.120 |
| F value | | 8.410 ** | | | 10.749 ** | F value | | 2.301 * | | | 2.191 * |
| DW | | 2.125 | | | 2.340 | DW | | 2.195 | | | 2.211 |

Note: ** $p< 0.01$, * $p< 0.05$

### *4.2 Environmental performance analysis*

Next, we examine the determinants of environmental performance of a subsidiary in Vietnam. The dependent variables are WPER, APER, CO2PER, and WSTPER. The independent variables are external factors (GOV, COM, CUS), strategic factors (LDS or GOAL), and organizational factors (JOWN). The models are built as (3) (4) (5) and (6) below. As LDS and GOAL of the strategic factor were highly correlated each other, estimation was done

separately as mentioned above. The dummy variable was same as in Model 1.

Model 3:

$$WPER=\beta_{w1}GOV+\beta_{w2}COM+\beta_{w3}CUS+\beta_{w4}LDS(or\ GOAL)+\beta_{w5}JOWN+\beta_{w6}Dummy \quad (3)$$

Model 4:

$$APER=\beta_{a1}GOV+\beta_{a2}COM+\beta_{a3}CUS+\beta_{a4}LDS(or\ GOAL)+\beta_{a5}JOWN+\beta_{a6}Dummy \quad (4)$$

Model 5:

$$CO2PER=\beta_{c1}GOV+\beta_{c2}COM+\beta_{c3}CUS+\beta_{c4}LDS(or\ GOAL)+\beta_{c5}JOWN+\beta_{c6}Dummy \quad (5)$$

Model 6:

$$WSTPER=\beta_{ws1}GOV+\beta_{ws2}COM+\beta_{ws3}CUS+\beta_{ws4}LDS(or\ GOAL)+\beta_{ws5}JOWN+\beta_{ws6}Dummy \quad (6)$$

The results in Table 3 indicate that top leadership is significantly positive with water pollution prevention (WPER) and air pollution prevention (APER). It indicates top management compliance consciousness and behavior gives positive influence on environmental performance. In addition, government regulation (GOV) gives significantly positive influence to air pollution prevention, and community pressure (COM) influence water pollution prevention (WPER) positively. However, it was shown that the model using GOAL as independent variable was not significant in terms of F value and coefficient.

The results in Table 4 indicate that environmental goal (GOAL) is significantly positive with waste reduction (WSTPER) and $CO_2$ reduction (CO2PER). In general regulations criteria for solid waste and $CO_2$ emission are not in place, and the responsibility requires commitment by organizations to contribute to sustainable development as corporate social responsibility. Therefore, voluntarily goal setting and commitment under the management initiative are essential.

From these data, we recognize the strategic factors that influence environmental performance under the legal standard of emission are compliance consciousness and top management behavior. Alternatively, voluntary goals and commitment towards this goal influence environmental performance without emission criteria.

Table 3. Results of analysis (WPER, APER)

| | Model3 (WPER) | | | | Model4 (APER) | | | |
|---|---|---|---|---|---|---|---|---|
| | Coefficient | tvalue | Coefficient | tvalue | Coefficient | tvalue | Coefficient | tvalue |
| GOV | -0.059 | -0.448 | -0.056 | -0.416 | 0.324 | 2.374 * | 0.312 | 2.261 * |
| COM | 0.343 | 2.661 ** | 0.353 | 2.677 ** | 0.015 | 0.111 | 0.032 | 0.233 |
| CUS | -0.025 | -0.217 | -0.040 | -0.350 | -0.019 | -0.167 | -0.034 | -0.296 |
| JOWN | 0.051 | 0.435 | 0.027 | 0.227 | 0.025 | 0.210 | -0.001 | -0.012 |
| LDS | 0.322 | 2.782 ** | | | 0.276 | 2.358 * | | |
| GOAL | | | 0.192 | 1.604 | | | 0.148 | 1.235 |
| Dummy(scale) | -0.105 | -0.951 | -0.095 | -0.845 | -0.082 | -0.736 | -0.077 | -0.681 |
| Constant | 2.429 | 2.821 ** | 3.059 | 3.691 ** | 2.236 | 2.698 ** | 2.815 | 3.518 ** |
| $AdjR^2$ | | 0.132 | | 0.066 | | 0.135 | | 0.076 |
| F value | | 2.897 * | | 1.923 | | 2.906 * | | 2.048 |
| DW | | 1.930 | | 1.985 | | 2.069 | | 2.279 |

Note: ** p< 0.01, * p< 0.05

Table 4. Results of analysis (WSTPER, CO2PER)

| | Model5 (WSTPER) | | | | Model6 (CO2PER) | | | |
|---|---|---|---|---|---|---|---|---|
| | Coefficient | tvalue | Coefficient | tvalue | Coefficient | tvalue | Coefficient | tvalue |
| GOV | 0.187 | 1.417 | 0.155 | 1.206 | 0.139 | 0.910 | 0.086 | 0.624 |
| COM | 0.206 | 1.600 | 0.225 | 1.795 | 0.037 | 0.247 | 0.065 | 0.479 |
| CUS | 0.051 | 0.449 | 0.023 | 0.208 | 0.013 | 0.103 | 0.005 | 0.042 |
| JOWN | -0.004 | -0.035 | 0.024 | 0.215 | -0.069 | -0.514 | 0.052 | 0.426 |
| LDS | 0.160 | 1.396 | | | -0.002 | -0.014 | | |
| GOAL | | | 0.241 | 2.098 * | | | 0.400 | 3.323 ** |
| Dummy(scale) | 0.087 | 0.791 | 0.043 | 0.400 | 0.157 | 1.248 | 0.072 | 0.634 |
| Constant | 2.384 | 2.974 ** | 2.232 | 3.117 ** | 3.296 | 2.333 * | 1.012 | 0.855 |
| $AdjR^2$ | | 0.122 | | 0.139 | | - | | 0.124 |
| F value | | 2.779 * | | 3.147 ** | | 0.703 | | 2.692 * |
| DW | | 2.286 | | 2.439 | | 1.946 | | 1.929 |

Note: ** p< 0.01, * p< 0.05

## 5. Conclusion

This paper examined environmental management transfer based on the data collected from Japanese-related firms in Vietnam. The results of analysis show certain characteristics of environmental behavior. It is clear that an environmental management system and practices are transferred from Japanese firms to overseas subsidiaries. MNEs contribute to the improvement of environmental management practice in Vietnam.

First, ISO14001, green purchasing, and ownership and environmental goal of the parent company positively affect the environmental management of overseas subsidiaries. It became clear that the parent company's ISO14001 is the determinant of ISO14001 of subsidiaries, and parent green purchasing is the determinant of the subsidiary's green purchasing.

Second, this relationship can be explained in that organizational capabilities are accumulative and path-dependent as the resource-based view argument. When the environmental capabilities of the parent company accumulate, the environmental capabilities of the subsidiary firm are enhanced through transfer to the subsidiary operation. Consequently, the competitive advantage of the subsidiary may be intensified. There is, however, a time gap between the two organizations. After the building of the environmental management system and capabilities in the parent firms, the transfer of the systems and the capabilities to the overseas operation follows. In most cases, the mother factory system in MNEs is still effective as far as environmental management transfer is concerned. Therefore, the one-way transfer of capabilities and environmental management systems to overseas operations is in place.

Third, top leadership, government regulation and community significantly affect the environmental performance of subsidiaries. Individually, community demand affects water pollution prevention and government regulation affects air pollution prevention. Top management is effective for water and air pollution prevention. Voluntary goals affect solid waste reduction and $CO_2$ emission, which are not strictly regulated. This suggests that $CO_2$ reduction will be strengthened by stronger governmental pressure with clear emission control.

## References

Aragón-Correa, J.A. & Sharma,S. (2003). A Contingent Resource-Based View of Proactive Corporate Environmental Strategy, *Academy of Management Review*, 28(1), 71-88. http://dx.doi.org/10.5465/AMR.2003.8925233

Barney, J. B. (1991). Firm resources and sustained competitive advantage, *Journal of Management*, 17(1), 99-120. http://dx.doi.org/10.1177/014920639101700108

Beise, M. & Rennings, K. (2005). Lead markets and regulation: a framework for analyzing the international diffusion of environmental innovations, *Ecological Economics*, 52, 5-17. http://dx.doi.org/10.1016/j.ecolecon.2004.06.007

Buckley, P. J. & Casson, M. (1976). *The Future of the Multinational Enterprise*. MacMillan.

Buysse, K. & Verbeke, A. (2003). Proactive environmental strategies: A stakeholder management perspective, *Strategic Management Journal*, 24, 453-470. http://dx.doi.org/10.1002/smj.299

Cohen, W. M. & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation, *Administrative Science Quarterly*, 35, 128-152. http://dx.doi.org/10.2307/2393553

Dunning, J. H. (1988). The Eclectic Paradigm of International Production: A Restatement and some Possible Extensions, *Journal of International Business Studies*, 19(1), 1-31. http://dx.doi.org/10.1057/palgrave.jibs.8490372

Elkington,J. (1994). Towards the sustainable corporation: win-win-win business strategies for sustainable development, *California Management Review,* 36(2), 90-100. http://dx.doi.org/10.2307/41165746

Esty, D. C. & Porter, M. E. (1998). Industrial Ecology and Competitiveness, *Journal of Industrial Ecology*, 2(1), 35-43. http://dx.doi.org/10.1162/jiec.1998.2.1.35

Fang, Y., Jiang, G.F., Makino, S., & Beamish, P.W. (2010). Multinational Firm Knowledge, Use of Expatriates, and Foreign Subsidiary Performance, *Journal of Management Studies,* 47(1), 27-54. http://dx.doi.org/10.5465/AMBPP.2008.33650204

Gupta, A. K. & Govindarajan, V. (2000). Knowledge Flows within Multinational Corporations, *Strategic Management Journal*, 21, 473-496. http://dx.doi.org/10.1002/(SICI)1097-0266(200004)21:4<473::AID-SMJ84>3.0.CO;2-I

Hart, S. L. (1995). A natural-resource-based view of the firm, *Academy of Management Review*, 20(4), 986-1014.

Henriques, I. & Sadorsky, P. (1996). The Determinants of an Environmentally Responsive Firm: An Empirical Approach, *Journal of Environmental Economics and Management*, 30(3), 381-395. http://dx.doi.org/10.1006/jeem.1996.0026

Jaffe, A. B. & Stavins, R. S. (1995). Dynamic Incentives of Environmental Regulations: The Effects of Alternative Policy Instrument on Technology Diffusion, *Journal of International Economics and Management,* 29, 43-63. http://dx.doi.org/10.1006/jeem.1995.1060

Jeppesen, S. & Hansen, M. W. (2004). Environmental Upgrading of Third World Enterprises through Linkages to Transnational Corporations: Theoretical Perspectives and Preliminary Evidence, *Business Strategy and Environment*, 12, 261-274. http://dx.doi.org/10.1002/bse.410

Pèrez-Nordtvedt,L., Kedia,B.L., Datta.D.K., & Rasheed, A.A.(2008). Effectiveness and Efficiency of Cross-Border Knowledge Transfer : An Empirical Examination, *Journal of Management,* 45(4), 714-744. http://dx.doi.org/10.1111/j.1467-6486.2008.00767.x

Popp, D. (2006). International innovation and diffusion of air pollution control technologies: the effects of NO*x* and $SO_2$ regulation in the US, Japan, and Germany, *Journal of Environmental Economics and Management*, 51(1), 46-71. http://dx.doi.org/10.1016/j.jeem.2005.04.006

Porter, M.E. (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors,* The Free Press.

Porter, M.E. & van der Linde, C. (1995). Toward a New Conception of the Environment-Competitiveness Relationship, *Journal of Economic Perspectives*, 9(4), 97-118. http://dx.doi.org/10.1257/jep.9.4.97

Rugman, A. M. & Verbeke, A. (1998). Corporate strategies and environmental regulations: an organizing framework, *Strategic Management Journal*, 19(4), 363-375. http://dx.doi.org/10.1002/(SICI)1097-0266(199804)19:4<363::AID-SMJ974>3.0.CO;2-H

Shrivastava, P. (1995). Environmental Technologies and Competitive Advantage, *Strategic Management Journal*, 16, 183-200. http://dx.doi.org/10.1002/smj.4250160923

Tsai, W. (2001). Knowledge Transfer in Interorganizational Networks: Effects of Network position and Absorptive Capacity on Business Unit innovation and Performance, *Academy of Management Journal,* 44(5), 996-1004. http://dx.doi.org/10.2307/3069443

WBCSD. (2000). *Measuring Eco-efficiency, A Guide to Reporting Company Performance,* WBCSD.