Local Responsiveness Pressure, Subsidiary Resources, Green Management Adoption and Subsidiary's Performance: Evidence from Taiwanese Manufactures

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ABSTRACT. This study aims to explore if local responsiveness pressure and subsidiary resources influence green management adoption of overseas subsidiaries, and to investigate the relationships between the level of green management adoption and performance. The 101 effective samples were collected from 583 Taiwanese firms, which are listed in the top 1000 manufactory firms and have invested in China. Through structural equation model (SEM) analysis' empirical results indicate that local responsiveness pressure and subsidiary resources both have positive effects on the level of green management adoption of the subsidiary. This study also suggests that the level of green management adoption is positively related to the subsidiary's performance.

KEY WORDS: green management, MNCs, performance, resource, stakeholders

Introduction

With the rapid development of industrial activities, air and water pollution, toxic emissions, chemical spills, and industrial accidents have created regional environmental and public health crises for thousands of communities around the world (Hart, 1995; Shrivastava, 1987). The public is placing an ever-greater emphasis on environmental issues, and few groups dare to publicly oppose the topic of natural conservation and environmental protection (Huang, 2005). In the past decade, several environmental protection treaties were developed including the Montreal Agreement (1989), the Basel Treaty(1992), the Kyoto Protocol (1997), and the "Committee of Trade and Environmental Protection" of the WTO, etc. Hereafter, the environmental issue has influenced corporate operations at every level (Aragon-Correa, 1998; Berry and Rondinelli, 1998; Greeno and Robinson, 1992).

In the view of institutional theory, organizations compete not just for resources and customers, but also for political power and institutional legitimacy, for social as well as economic leverage (DiMaggio and Powell, 1983). Environmental protection groups usually attempt to replace government efforts and utilize public opinion to force business adoption of environmental management (Berry and Rondinelli, 1998; Hart, 1995; Henriques and Sadorsky, 1999). Moreover, to environmental protecting groups, the trend toward proactive environmental management is also driven by pressures from governments, customers, employees, and competitors (Berry and Rondinelli, 1998). Contrary to the logic of passive or forced action, Hart (1995) advocated the natural resource-based view, which suggests that businesses must embrace and internalize the tremendous challenge created by the natural environment: Strategists and organizational theorists must begin to grasp how environmentally oriented resources and capabilities can yield sustainable sources of competitive advantage. Beyond complying with increasingly more

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stringent regulations, firms must protect or enhance their ethical images, avoid serious legal liabilities, satisfy the safety concerns of employees, respond to government regulators and stockholders, and develop new business opportunities to remain competitive in world markets (Berry and Rondinelli, 1998).

Compared with the abundant domestic studies of green management, few studies were conducted across borders. In order to save production costs, to enhance productivity and to effectively compete with MNCs in developed countries, those MNCs in developing countries are unwilling to fulfill green management practices in the host country. While facing unavoidable local responsiveness pressure, foreign firms are often held to a higher standard than the local counterparts and thus might have created superior technological capabilities related to green management. Scholars argued that foreign direct investment provides conflicting predictions for the environmental performance of foreign versus indigenous firms (King and Shaver, 2001). Since there are few studies[1] conducted on the limited analysis to the motivations of MNCs' subsidiaries performing green management activities, this study tries to examine critical determinants of green management pursued by overseas subsidiaries, especially from the perspective of MNCs in developing countries investing into host countries deemed developing countries[2]. Moreover, this study further investigates the relationships between the level of green management adoption and performance. In short, this study attempts to answer the following research questions:

RQ1.

Does local responsiveness pressure influence the level of green management adoption of the subsidiary?

RQ2.

Do subsidiary resources influence the level of green management adoption of the subsidiary?

RQ3.

What kind of relationships exists between green management adoption and performance?

Literature review hypotheses construction

Local responsiveness pressure and green management adoption of the subsidiary

Institutional theory is often quoted to explain the requirement of a firm's pursuing of environmental protection work. The isomorphism concept addresses that coercive isomorphism results from both formal and informal pressures exerted on organizations by other organizations upon which they are dependent on and by cultural expectations in the society within which organizations function. In some circumstances, organizational change is a direct responsiveness to government mandate, for example, manufactures adopt new pollution control technologies to conform to environmental regulations (DiMaggio and Powell, 1983). The other type of isomorphism is mimetic isomorphism resulting from standard responses to environmental uncertainty.

Based on institutional theory, Pangarkar and Klein (1998) showed that the motivation of interfirm alliances in the global pharmaceutical industry is resulted from following their competitors to enter into an alliance bandwagon. Similarly, the chemical manufactures in the United States formed the Chemical Manufacturers Association (CMA) to protect member firms from injurious government regulations and to protect the industry from outside intervention (King and Lenox, 2000). These evidences supported that organizations facing the same environmental restrictions and pressures would adopt similar strategies in order to survive.

Extending the scope abroad, theories of foreign direct investment have argued that foreign firms are at a disadvantage in a local market versus indigenous firms (e.g., Hymer, 1976). This is because foreign firms often face discrimination by host country consumers, governments, and suppliers (King and Shaver, 2001; Hymer, 1976). Henriques and Sadorsky (1996) indicated that a firm's formulation of its environmental plan is positively influenced by customer pressure, shareholder pressure, government regulatory pressure, neighborhood and community group pressure. The public has put increasing pressure on

governments to enact environmental regulations and legal restrictions that mitigate the adverse effects of pollution (Berry and Rondinelli, 1998). Besides, many researches have shown that customers would like to choose products which are not harmful to the environment (Huang, 2005; Chase, 1991; Weber, 1990). Green consumers are increasing by emphasizing on conservation, and if enterprises do not emphasize the eco-friendly ingredients of their products, these consumers may reject them (Greeno and Robinson, 1992; Peattie, 1992). To respond to environmental pressure in the host country, it is necessary for MNCs to adopt green management. The first hypothesis proposed in this study is as follows:

Hypothesis 1   Local responsiveness pressure in host country is positively related to the level of green management adoption of the subsidiary.

Subsidiary resources and green management adoption of a subsidiary

We will use three dimensions, the subsidiary's autonomy, the organization culture, and the integration of supply chain, to examine the relationship between the abundance of subsidiary resources and the level of green management adoption of the subsidiary.

First, successful companies have found that environmental management works only if it is decentralized (Berry and Rondinelli, 1998). As the level of resources possessed by the subsidiary increase, the subsidiary reduces dependence on its headquarter and becomes more important to the performance of the MNC (Norhria and Ghoshal, 1994). Abundant resources possessed by the subsidiary can enhance its capacity of achieving organizational goals if it is granted greater autonomy and flexibility in making decisions. The greater the autonomy held by the subsidiary, the higher possibility it would have more involvement in green management to create competitive advantage or to respond to the pressure from stakeholders in the host country.

Second, from the perspective of organization culture, the employees, stockholders, and managers believe it is morally right that a business should be environmentally responsible, which is a reflection of their personal attitudes and beliefs in social responsibility (Petts et al., 1998). Under these circumstances, top management in MNCs will be inclined to support subsidiaries to undertake green management. The resource-based view also presents that the most important assets are strategic resources: those that are rare, valuable, and difficult to imitate. According to the above-mentioned attributes, scholars contended culture competitiveness is a strategic resource within supply chains (Hult et al., 2002). Culture competitiveness is also associated with innovativeness. Quinn and Kimberly (1984) described adhocracy as one type of organizational culture. Adhocracy culture is organizational unit(s) that can reconfigure themselves rapidly when new circumstances arise. However, through innovativeness, people in adhocracies seek not only to simply meet customers' current needs, but also to "surprise and delight" customers by anticipating their future needs (Cameron and Quinn, 1999). Hence, the MNCs confront equivocal conditions such as environment protection regulations' variation, and they would support overseas subsidiaries adopting green innovative activities. Consequently, the subsidiaries can satisfy stakeholders' requirements and strengthen firms' culture competitiveness.

Last, one of the key parts of green management adoption is about the concept of concurrent engineering. During the product research and development stage, the focal firm might request its suppliers to provide "green components" and/or invite them to join in with its green management. On the other hand, firms might build a green-oriented supplier network in order to attain necessary information, which would be helpful for firms to adopt green management. Consequently, subsidiaries with closely cooperating supplier networks which offer the raw materials engaged in green management are capable of carrying out green management. To summarize the above perspectives, we can derive the second hypothesis.

Hypothesis 2   The abundance of subsidiary resources is positively related to the level of green management adoption of the subsidiary.

Green management adoption and performance

The natural-resource-based view argues that businesses (markets) will be constrained by and dependent upon ecosystems (nature). In other words, it is likely that strategy and competitive advantage in the coming years will be rooted in capabilities that facilitate environmentally sustainable economic activity (Hart, 1995). Enterprises could adopt pollution prevention in order to lower costs or to gain leading positions through product stewardship. Businesses through properly designed environmental standards can trigger innovations that lower the total cost of a product or improve their value (Hart, 1995). Ultimately, this enhanced resource productivity makes companies more competitive (Porter and Van der Linde, 1995).

Through proactive environment management, enterprises may create competitive advantages including cost reduction, revenue enhancement, supplier ties, quality improvement, competitive edge, reduction of liabilities, increase of social and health benefits, positive public image, and creation of new product markets (Shrivastava, 1995). Notably, some empirical studies showed that proactive companies have found the management of environmental costs does more than improve operational and financial performance, although it can also lead to improvements in the health of employees and local communities, enhancing the image of the company as a desirable employer and corporate citizen (e.g. Berry and Rondinelli, 1998).

Built on the above discussion, we inferred that businesses pursuing green management activities could both improve financial performance and non-financial performance. Hence, the third hypothesis was conducted as follows:

Hypothesis 3-1   A positive relationship exists between the level of green management adoption of the subsidiary and its financial performance.

Hypothesis 3-2   A positive relationship exists between the level of green management adoption of the subsidiary and its non-financial performance.

Financial performance and non-financial performance

The firm's external constituencies determine its reputation. Firms engaging in green management can create better customer satisfaction and enhance their business image. Hence, green management adoption might be beneficial for improving business reputation. A growing number of researchers argue that good corporate reputations have strategic value for firms that possess them. On the basis of the resource-based view, firms with assets that are valuable and rare own a competitive advantage and may expect to earn superior returns. Forms whose assets are also difficult to imitate may achieve sustained superior financial performance (Grant, 1991).

Good reputations provide the rationale for a cross-sectional relationship between reputation and financial performance (Fombrun, 1996). For customers, they value associations and transactions with high-reputation firms. Furthermore, reputation also serves as a signal of the underlying quality of a firm's products and services; consumers may pay a premium for the offerings of high-reputation firms (Shapiro, 1983). For suppliers, they are less concerned about contractual hazards when transacting with high-reputation firms; good reputations should also lead to lower contracting and monitoring costs (Goldberg and Hartwick, 1990). On the other hand, firms with a good reputation may also possess a cost advantage because employees prefer to work for high-reputation firms, and should therefore work harder, or for lower remuneration (Shapiro, 1983). Fombrun and Shanley (1990) had quoted lots of scholars' perspectives and pointed out that businesses having good reputations may enable them to charge premium prices, attract better applicants, enhance their access to capital markets, and attract investors.

According to the above arguments, business' reputation is affected by the stakeholders, such as current competitors, consumers, stockholders, and

employees. If firms maintain a good reputation, they will incur better non-financial performance, and further affect the financial performance. Thus, we propose that a good reputation of the subsidiary will first affect local customers' satisfaction and promote the subsidiary's business image. Consequently, higher customer evaluation and superior business image of the subsidiary will lead to better financial performance.

Hypothesis 4   A positive relationship exists between the subsidiary's non-financial performance and its financial performance.

Methodology

Samples

This sample was selected from Taiwan's manufacturers ranked in the top 1000 turnover. We further checked these manufacturers to see which had invested in China through the publication of the Ministry of Economic Affairs, R.O.C. The reason for choosing the top 1000 manufacturers investing in China was that environmental management has relationship with its scope (Aragon-Correa, 1998; Shen, 1998), and thereby examines the circumstances of subsidiaries engaging in green management in China. About 583 questionnaires were sent out by mail and 123 questionnaires were returned or 21.1%; of these 101 samples only 18% were valid. Most respondents are vice presidents, managers or directors who are familiar with the green management practices of subsidiaries.

Measures

Existing scales identified through the literature review were modified to suit the research purpose and particular study context. Most of the measurements ranged from one to five (1 = strongly disagree, 5 = strongly agree) and were reported in the Appendix 1.

Local responsiveness pressure (LRP)
Three dimensions of local responsiveness pressure (LRP) considered in this study were local pressure groups, the intensity of local competitors, and the expectation of major customers. Most of the items used to measure these three dimensions were adapted from Aragon-Correa (1998) and the environmental performance standard of ISO 14031. Each of the three dimensions was measured by two items. Cronbach's α coefficient for the scales of local stress groups, the intensity of local competitors, and the expectation of major customers were 0.69, 0.69, and 0.87, respectively.

Subsidiary resources (SR)
The construct of subsidiary resources (SR) was measured with three dimensions: the degree of local suppliers' cooperation, strategic importance of the subsidiary, and support from top management of headquarter. Each dimension was measured by two or three items, which were adapted from Henriques and Sadorsky (1996) and Yip (1995). Cronbach's α coefficient for the three dimensions were 0.80, 0.50, and 0.87, respectively.

Green management adoption (GMA)
This research defined green management practices as producing environmental friendly products and minimizing the impact through three constructs: green production (GP), green R&D (GRD), and green marketing (GM). This study modified the scale of natural environmental approaches developed by Aragon–Correa (1998). The natural environment-related practices questionnaire included 10 items. Each item was measured as follows: 0 = never, 2 = seldom, 4 = usually. Cronbach's α coefficient for the scales of three constructs were 0.65, 0.69, and 0.69, respectively.

Financial performance (FP) and non-financial performance (NFP)
The construct of financial performance (FP) was measured with four items: facilitating marketing and product benefits, revenue improvement by performing environmental improvement projects, competitiveness enhancement in local market, and competitiveness enhancement in export market. Non-financial performance (NFP) was measured by two items: public relationship and corporate image improvement, and customers' satisfaction improvement. These items were adapted from the environmental performance standard

of ISO 14031. Cronbach's α coefficient for the scales of financial performance and non-financial performance were 0.83 and 0.70.

Control variable: the relationship between Subsidiary resources and performance

Past studies have showed there are a significant positive relationship between subsidiary resources and its performance (e.g. Nohria and Ghoshal, 1994), while this study highlights how subsidiary resources affect its performance through the mediating effect of green management adoption. To avoid inferences of spurious causal relationships, we still need to control the direct effect of subsidiary resources on its performance.

The findings of the empirical survey

The analysis for testing the proposed hypotheses was carried out in three stages. In the first stage, reliability and the construct validity of independent and dependent constructs were evaluated using Cronbach's α coefficient and confirmatory factor analysis (CFA). In particular, a second-order CFA was conducted for the local responsiveness pressure (LRP) and subsidiary resources (SR) dimensions, as indicated in the literature (Aragon-Correa, 1998; Henriques and Sadorsky, 1996; Yip, 1995). After reliability and construct validity were established, composite scores were used to reflect the underlying construct dimensions and to test the hypotheses using structural equation modeling (SEM) in the final stage.

Reliability

For all eleven multiple-item scales, the Cronbach's α coefficient for each set of items was computed to examine the reliability of measures and are reported in the Appendix 1. All scales demonstrated acceptable reliabilities, with the two highest Cronbach's α coefficient for expectation of major customers and support from top management of headquarter measures (0.87) and the lowest coefficient α for strategic importance of the subsidiary measures (0.50).

Measurement validity

Construct validity was examined using CFA for all the construct measures included in this study. The results are reported in Appendix 1. The model provides an acceptable fit ($\chi^2(322) = 455.53$, CFI = 0.899, standardized RMR = 0.07). All factor loadings were statistically significant at the 5% level, and most of the factor loadings exceed the arbitrary 0.5 standard. Thus these measures demonstrate adequate convergent validity.

All of the cross-construct correlations were significantly different from 1.0, which suggests that discriminant validity was present. In general, these results provide support construct validity for measures employed in the study.

The constructs 'local responsiveness pressure (LRP) and 'subsidiary resources (SR)' were hypothesized to have a second-order factor structure. The overall fit statistics of a second-order CFA model were compared with the model where all constructs were treated as first-order constructs, to demonstrate the existence of a second-order construct.

The second-order model as a whole has a satisfactory fit to the data ($\chi^2(188) = 315.25$, CFI = 0.859, standardized RMR = 0.068). All second-factor loadings are significant (Appendix 2). Given the parsimonious nature of the second-order factor model, and the insignificant difference in fit in the two pair measurement models ($\triangle\chi^2 = 0.91$, $P > 0.05$), the second-order factor structures for local responsiveness pressure and subsidiary resources are preferred. This is consistent with the empirical findings of previous research (Aragon-Correa, 1998; Henriques and Sadorsky, 1996; Yip, 1995).

Structural equation model

Once the unidimensionality of the measure was established, composite scores of each construct were used to test a structural equation model (Bandalos and Finney, 2001). Table 1 shows correlations among the variables in this study.[3] The data were analyzed by AMOS 5.0 using path analysis. Figure 1 provides the parameter estimates of the proposed model. The overall fit statistics indicated an adequate fit of model to data (Table 2). We assessed multiple fit indices to check the overall model fit. Most fit indicators appear ideal model fit, while the root mean square error of approximation (RMSEA) is a lack of fit per degree

TABLE 1

Construct means, standard deviations and correlation coefficients

Construct	M.	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)GP	3.45	0.73	1	0.60	0.64	0.37	0.39	0.40	0.36
(2)GRD	2.77	0.97	0.60	1	0.73	0.37	0.36	0.50	0.45
(3)GM	3.12	0.85	0.64	0.73	1	0.44	0.28	0.46	0.42
(4)LRP	2.82	0.65	0.37	0.37	0.44	1	0.52	0.47	0.43
(5)SR	3.32	0.55	0.39	0.36	0.28	0.52	1	0.56	0.51
(6)FP	3.48	0.64	0.40	0.50	0.46	0.47	0.56	1	0.66
(7)NFP	3.87	0.61	0.36	0.45	0.42	0.43	0.51	0.66	1

Note: All coefficients greater than 0.28 are significant at $P < 0.01$.

of freedom of Green production and R&D (RMSEA = 0.13; 0.11). Overall, the model fit of marketing is the best one of the three models (Table 2).[4]

The hypothesized relationship between local responsiveness pressure and green management adoption is positive and significant ($P < 0.05$), which supports H_1. This implies that in order for the MNCs to respond to environmental pressure in the host country, it is necessary for the subsidiary to adopt green management.

Subsidiary resources have significant and positive effects on green production and R&D activities adoption, while not on green marketing (Figure 1). Overall, the result indicated that greater resource possessed by the subsidiary could enhance its capability of pursuing green management. Hypothesis 2 was supported.

Empirical findings also suggested that financial performance and non-financial performance are both significantly ($P < 0.05$) affected by fulfilling green management except the nonsignificant effect

of green production on financial performance. H_{3-1} and H_{3-2}. were also supported. The outcome confirmed that the subsidiary pursuing green management not only enhance financial performance but also improve non-financial performance as well. Furthermore, empirical results provided evidence that non-financial performance have significant and positive effect on financial performance ($P < 0.01$), which confirmed H_4. It indicated that if the subsidiary has a good reputation and/or higher customers' satisfaction, it would incur the firm's better non-financial performance and further improve the financial performance.

In all, the results found that local responsiveness pressure has positive effects on performance through mediating effect of adopting green production, marketing, and R&D. Subsidiary resources also have positive effects on performance both by direct effect and mediating effect through adopting green management. Furthermore, non-financial performance can bridge green management and financial performance.
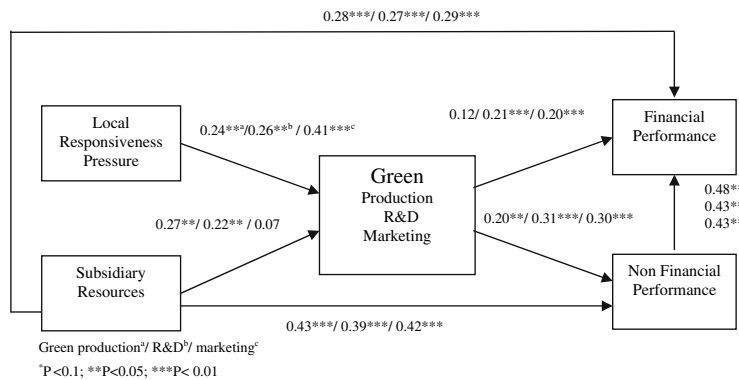

0.28***/ 0.27***/ 0.29***

Local Responsiveness Pressure

0.24***a/0.26**b / 0.41***c

0.12/ 0.21***/ 0.20***

Financial Performance

Green Production R&D Marketing

0.27**/ 0.22** / 0.07

0.20**/ 0.31***/ 0.30***

0.48***/ 0.43***/ 0.43***

Subsidiary Resources

Non Financial Performance

0.43***/ 0.39***/ 0.42***

Green production[a]/ R&D[b]/ marketing[c]

[*]P <0.1; **P<0.05; ***P< 0.01

Figure 1. Hypothesized model with composite measures.

TABLE 2

The multiple indices of model fit

	Absolute fit			Incremental fit			Parsimonious fit			
	χ^2	GFI	RMSEA	CFI	AGFI	NFI	TLI	$\chi^2/$ df	PNFI	PGFI
GP	5.71 ($p = 0.05$)	0.97	0.13	0.97	0.83	0.96	0.88	2.85	0.19	0.13
GM	2.38 ($p = 0.30$)	0.99	0.04	0.99	0.93	0.98	0.98	1.19	0.19	0.13
GRD	4.24 ($p = 0.12$)	0.98	0.11	0.98	0.87	0.97	0.93	2.21	0.19	0.13

Discussion and implications

This article makes a contribution by constructing a comprehensive model, which explores antecedents and consequences of green management adoption of overseas subsidiaries. With an empirical application to Taiwan's top 1000 manufacturers, results show that the mediating effect of green management adoption does exist between local responsiveness pressure and performance. This study also demonstrates the subsidiary resources would influence financial and non-finacial performance through adopting green management. Eventually, non-financial performance would further affect financial performance.

A positive relationship exists between the level of green management and the level of local responsiveness pressure. It indicates that the more stress exerted by environmental groups, indigenous counterparts and major customers in host country, the more green management will be practiced by the subsidiary. The result is similar to that of Berry and Rondenelli (1998), which also showed that a firm's proactive environmental management is in order to respond to diverse stakeholders. In addition, this finding confirms that MNCs receiving extra attention by host country consumers, government and suppliers will make them pursue more efforts in environmental management (King and Shaver, 2001).

In respect to the close relationships between subsidiary resources and the development degree of green management, we infer that a subsidiary with greater autonomy, superior supplier network, and more support from headquarter will enhance its capability to perform green management. This finding confirms the autonomy theory, which argues that a subsidiary with abundant resources, completed supply chain and strong linkages of internal network in the host country will possess more autonomy (Wu, 1996; Norhria and Ghoshal, 1994). On the other hand, Berry and Rondinelli (1998) mentioned that MNCs adopt green management successfully only if it is decentralized. As a result, the subsidiary owning more resources will have more motivation to adopt green management.

Another finding is that the subsidiary pursuing green management will improve its financial and non-financial performance as well. This result meets some conclusions of previous researchers. For example, well-formulated environmental strategies can lead to better quality, reduced costs, improved environmental image, and the opening of new markets (Maxwell et al. 1997), thus enhancing business competitiveness (Shrivastava, 1995). On the other hand, the subsidiary engaging in green management can improve business image and reputation, and further facilitate financial performance. This finding supports the mediation effect of non-financial performance between subsidiary's green management adoption and financial performance.

Generally, the subsidiary adopting green management practices will improve its performance. As the model fit of green marketing is the best one of this study, it implies that green marketing might be the critical and prior job of green management practices. Empirical results also showed the abundance of subsidiary resources will not affect its green marketing adoption (Figure 1). Previous studies had mentioned that using recycle package materials, participating in community environmental activity, and developing products that have a minimum influence on the environment can command premium prices in some markets due to their "green" attributes (Maxwell et al., 1997;

Berry and Roindinelli, 1998). Thus, the subsidiary in the developing country would consider adopting green marketing activities in advance and the top priority. In this study, while adopting green production cannot directly induce higher financial performance, it still has indirect positive influence on financial performance through improving non-financial performance first and consequently enhancing financial performance.

The world-wide movement toward more efficient and effective environmental management will profoundly influence the policies of multinational corporations. Although there is a large body of studies exploring determinants of the environmental management by domestic firms, there are few studies investigating the motivations of the developing country's MNC fulfilling environmental management. This research tries to shed some light on environmental strategies from the perspective of MNCs from developing countries investing into host countries categorized as developing countries. We believe there is still large room for considerable improvement of the present model based on the above-mentioned approach.

Management implications

In business today, companies cannot ignore environmental issues. Increasing government regulation and stronger public mandates for environmental accountability have brought these issues into the executive suite, and onto strategic planning agendas (Walton et al., 1998). However, when crafting specific environmental strategies, firms undoubtedly attach greater importance to other stakeholders over government regulators (Neu et al., 1998). Due to economic globalization, there were many businesses investing in China in the past ten years. Increasingly, with the flourish of industry development, the stakeholders in China have paid more attention to foreign firms' environmental practices. Thus, subsidiaries invested in China should cooperate with stakeholders such as suppliers, customers, governments and groups.

Furthermore, the developing country's MNCs investing in the developing country need to fulfill green management accurately. Hart (1995) argued that large multinational corporations which want to keep a sustainable development strategy must reduce the environmental burden created by economic activity. As a result, the MNCs' subsidiaries in order to compete with indigenous counterparts and other foreign competitors should develop sustainable technologies and products, thereby providing international competitive advantage.

Limitations and directions for future research

Some limitations of this study should be recognized. First, this study used cross-sectional data to derive causation. Thus, this research cannot detect changes of environmental practices over time. Another limitation of the study is that the samples are limited to Taiwan's top 1000 manufacturers investing in China. Hence, conclusions of the present study cannot be generalized to the manufacturers investing in other developing countries. Besides, as we have mentioned previously, there are high correlate relationships among green production, green marketing, and green R&D. Under insufficient theoretical background, we did not further explore the additive effect, causal and interactive relationships among the green management practices. We strongly suggest future studies could investigate those effects of these activities based on sound theoretical foundations that might be built up through qualitative studies.

Acknowledgments

Appendix

TABLE 3

Appendix 1: Construct measures and validity assessment

Measures	Factor loadings
Local pressure groups(α = 0.69)	
Local environmental groups often accuse that firms' environmental protection works don't comply with environmental regulations. (L1)	0.753
Community residents often protest against firms in order to push them to obey environmental regulations. (L2)	0.703
The intensity of local competitors (α = 0.69)	
Firms' environmental jobs are often strictly criticized by local counterparts. (C1)	0.575
Green management adoption is one of the competitive advantage sources in the industry. (C2)	0.946
Expectation of major customers (α = 0.87)	
Customers would like to choose products which are not harmful to the environment. (E1)	0.846
Green customers are one of the important reasons pushing business to pursue environmental management. (E2)	0.902
The degree of local suppliers' cooperation(α = 0.80)	
There are many local firms which can cooperate with implementing green management. (S1)	0.692
Local suppliers have strong wills to cooperate in implementing green management. (S2)	0.956
Support from Top management of headquarter (α = 0.87)	
Top management of headquarter have will to support subsidiaries pursuing green management (T1)	0.759
Top management of headquarter have proactive attitude toward subsidiary's environmental management. (T2)	0.914
Top management of headquarter attach great importance to subsidiary's suggestion about environmental improvement. (T3)	0.821
Strategic importance of the subsidiary (α = 0.50)	
Foreign subsidiary's revenue is important to headquarter. (SI1)	0.599
Foreign subsidiary's scale is larger than local counterparts. (SI2)	0.558
Green Production (α = 0.65)	
Performing facility waste reduction activity.	0.735
Performing producing process improvement.	0.492
Performing resources recycling	0.709
Green R&D (α = 0.69)	
Utilizing product life cycle method to develop green products	0.765
Adopting energy saving facility	0.399
Adopting green product design	0.868

TABLE 3

Appendix 1: continued

Measures	Factor loadings
Green Marketing (α = 0.69)	
Adopting green product promotion and communication	0.791
Using recyclable package materials	0.568
Participating community's environmental activity	0.477
Performing waste recycling	0.501
Financial performance(α = 0.83)	
Facilitating marketing and product benefits	0.798
Revenue improvement by performing environmental improvement project	0.578
Competitiveness enhancement in local market	0.732
Competitiveness enhancement in export market	0.829
Non-financial performance (α = 0.70)	
Public relationship and corporate image improvement	0.610
Customers' satisfaction improvement	0.889

TABLE 4

Appendix 2: Standardized estimates of a second-order CFA model

Indicator	Local pressure groups	The intensity of local competitors	Expectation of major customers	The degree of local suppliers' cooperation	Support from top management of headquarters	Strategic importance of the subsidiary
First-order factor loadings						
L1	0.821					
L2	0.644					
C1		0.600				
C2		0.910				
E1			0.840			
E2			0.908			
S1				0.691		
S2				0.957		
T1					0.749	
T2					0.921	
T3					0.822	
SI1						0.575
SI2						0.581

Second-order factor	Local responsiveness pressure	Subsidiary resources
Second-order factor loadings		
Cronbach's coefficient α	0.67	0.59
Local pressure groups	0.324	
The intensity of local competitors	0.731	
Expectation of major customers	0.889	
The degree of local suppliers' cooperation		0.498
Support from top management of headquarter		0.588
Strategic importance of the subsidiary		0.622

Note: All parameters are significant at the 0.05 level.

Notes

[1] We reviewed literatures related to environmental issues from nine journals in the past ten years, which includes the Academy of Management Journal, Academy of Management Review, Administrative Science Quarterly, Harvard Business Review, Management Science Strategic Management Journal, Journal of World Business, Journal of International Business Studies, and Management International Review. There are in total 8,339 studies, among which there are 64 literatures based on RBV theory, 912 literatures explored by stakeholder theory, and 55 literatures probed by institutional theory to explain why businesses pursue green management activities.

[2] Using the MNC's country and the host country matrix, four possible combinations are developed → developed, developing → developing, developed → developing, and developing → developed, respectively. This study focuses on the combination of developing (Taiwan) → developing (China). Although there is a debate of sovereignty, Taiwan and China actually own their independent and specific environmental regulations. Certainly, the characteristics of firms' stakeholders are not all the same with each other.

[3] Table 1 reveals green production, green R&D and green marketing have high correlations. As we have known, there are few studies investigating the relationship among these three activities based on a theoretical foundation. Thus, we did not intend to examine their interaction relationships.

[4] The χ^2 is sample size dependent and favors complex models. GFI are sample size dependent and tend to decrease sharply as the sample size goes below 200 (Bentler and Bonett, 1980; Hu and Bentler, 1999). Hu and Bentler (1995) note: GFI behaves inconsistently across estimation methods at sample sizes of 250 or smaller and NFI is not a good indicator for evaluating model fit when N is small. CFI and RMSEA provide a better idea of the fit when sample sizes are small. Thus we have looked at these indices to identify a model. Hu and Bentler (1999) suggest that CFI > 0.95 is deemed a good fit. Similarly, Browne and Cudeck (1993) suggest that RMSEA < 0.05 can be considered a close fit.

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