A Knowledge-Based View of Environmental Performance in Different Cultural Contexts: Canada, Japan, and China

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We would like to thank Masao Nakamura, Weijiong Zhang, and Genevieve Bassillier for sharing data and information essential to this research.

A Knowledge-Based View of Environmental Performance in Different Cultural Contexts: Canada, Japan, and China

The resource-based view of the firm teaches us that valuable, rare, hard to imitate, non-substitutable resources are a source of competitive advantage for a firm (Barney, 1991; Wernerfelt, 1984). Recently, the knowledge-based view has elaborated the nature of resources, focusing on the role of knowledge in obtaining a competitive advantage (Amit & Shoemaker, 1993; Conner & Prahalad, 1996; Foss, 1996; Grant, 1991; 1996a, 1996b; Kogut & Zander, 1996; Miller & Shamsie, 1996; Priem & Butler, 2001a, 2001b). Knowledge may be discrete as in patents or systematic as in ability to coordinate a group (Miller & Shamsie, 1996). Knowledge may also involve judgment, autonomy and discretion (Conner & Prahalad, 1996; Kogut & Zander, 1996). The proper management of knowledge as a competitive resource has been shown to influence firms' performance (Camerer & Vepsalainen, 1988; Chatman & Jehn, 1994; Furu, 2000; Hall, 1993; Henderson & Cockburn, 1994; Klassen & Whybark, 1999; Lindman, Callarman, Fowler, & McClatchey, 2001; Teigland, Fey, & Birkinshaw, 2000).

By implication, valuable, rare, inimitable, and non-substitutable resources around the environmental management should be a source of competitive advantage for a firm in the environmental arena and should improve environmental performance (Hart, 1995; Hart & Ahuja, 1996; King & Lenox, 2000). This would be particularly true if a firm has unique knowledge assets in this area (Grant, 1996a, 1996b). Studies have begun to link specific capabilities of a firm with environmental performance. Sharma (2000) has shown that a large amount of discretionary slack for managers, defined as having resources and decision-making discretion, helps managers to frame environmental issues in terms of an opportunity for action. Also, managers with discretionary slack tend to develop environmental initiatives voluntarily rather than because of coercion. Nevertheless, within this environmental domain, the role of environmental knowledge as a resource has not been elaborated, particularly at the firm level of analysis. Prior studies have also suggested that resources and capabilities play an important role in implementing corporate cultural norms. For example, for firms in the U.K., Bowen, Cousins, Lamming, and Faruk (2001) show that the influence of proactive corporate culture on the implementation of green supply practices was partially mediated by the development of specific supply management capabilities. Hart (1995) also argues that the existence of particular capabilities facilitates the implementation of environmental approaches such as pollution prevention programs and product stewardship. These capabilities are built over time from each firm's set of available resources and capabilities (Den Hond, 1996; Klassen & Whybark, 1999; Russo & Fouts, 1997; Teece, Pisano & Shuen, 1997). Rothenberg, Pil, and Maxwell (2001) have found that worker participation increased environmental efficiency in manufacturing processes. More efficient firms encouraged the development of specific skills for the identification and implementation of waste reduction, and their emphasis on skill development was stronger when these skills focused on valuable aspects of firms' production process (e.g. when the resulting skills helped firms save valuable resources). Chinander (2001) uses a case study approach to show that internal drivers, such as firm-level awareness and accountability influences the daily actions of the employees, which in turn impacts the overall environmental performance. Christmann (2000) investigates the effect of three best practices –use of pollution prevention technologies, innovation of proprietary technologies, and early timing of environmental strategies – on firms' cost advantage relative to its major competitors. Her findings suggest that implementation of environmental best practices increases cost advantages and that firms with higher levels of complementary assets gain stronger cost advantages (complementary assets are defined "resources or capabilities that allow firms to capture the profits associated with a strategy, technology, or innovation," Christmann, 2000: 666; Grant, 1996a; Kogut & Zander, 1992; Teece, 1987).

The research on organizations and environmental management needs to pay more attention to the internal capabilities that allow firms to implement environmental strategies in order to obtain competitive advantages (Christmann, 2000) and to contextual factors that influence capabilities, strategies, and practices (corporate and national cultures, Bansal & Roth, 2000; Egri & Herman, 2000; Sharma, 2000; Starik & Marcus, 2000; Starik & Rands, 1995).

Both environmental management theory and the knowledge-based view (KBV) of the firm do not deal with the role played by context, especially international context, in improving environmental performance. Current KBV work (Autio, Sapienza, a& Almeida, 2000; Conner & Prahalad, 1999; Foss, 1996) has begun to explore the importance of international context for knowledge and knowledge management, but done less to conceptualize this context. Very little comparative work exists on international environmental management (see Egri and Pinfield, 1996; Starik and Rands, 1995). To help fill this gap, we draw on notions of corporate culture

(Deal & Kennedy, 2000; Kotter & Heskett, 1992, Ouchi & Williams, 1985; Schein, 1997) and national culture (Begin, 1997; Hofstede, 1984; 1991; Hoecklin, 1995; Hampden-Turner & Trompenaars, 1993).

Corporate cultures can support or undercut competitive advantage. Having top managers involved in the corporate culture and clarifying the role of culture for all participants is critical for performance. Prior studies (Bansal & Roth, 2000; Sharma & Vredenburg, 1998; Winn, 1995) showed that a proactive cultural orientation helps increase firms' environmental performance. Cultures also vary nationally, (Begin, 1997; Hampden-Turner & Trompenaars, 1993; Hofstede, 1991; Trompenaars, 1993), and national cultural values supporting environmental protection can facilitate the development of closer relationships among business, communities, and the environment (Branzei, Vertinsky, Takahashi, & Zhang, 2001). These relationships, in turn, help foster new environmental technologies and can become be a source of international competitive advantage (Daly & Cobb, 1994; Hawken, 1993; Porter & Van der Linde, 1995).

Our argument here is relatively simple: resources and a combination of general and technical knowledge of environmental management will improve environmental performance, particularly when corporate and national cultures support such initiatives. To test this proposition, we build a structural equation model relating cultural context and environmental resources, knowledge, and performance variables. We test this model using survey data collected from firms in Canada, Japan, and China. A causal model relating the knowledge-based view of environmental performance to corporate culture makes a contribution to knowledge based theory, which has been calling for more studies of context (Fiol, 1991; Kogut & Zander, 1992; Bansal & Roth, 2000). Testing the model in three different countries makes a contribution not only to KBV theory but also to the research on environmental corporate culture, because there is a lack of systematic, comparative tests of how corporate culture influences environmental knowledge for firms from different countries. Finally, applying the model to the environmental context makes a contribution to the growing field of organization and environmental management, where few studies have shown how knowledge of environmental management can positively affect environmental performance (Bowen et al., 2001, Rothenberg et al., 2001; Sharma & Vredenburg, 1998). In our models, we examine environmental performance in three ways: as compliance with environmental standards (Nehrt, 1998; Rugman & Verbeke, 1998), as investment in new environmental innovations (Sanchez, 1997; Brown & Duguid, 1991), and as adoption of the ISO 14001 certification scheme (Roht-Arriaza, 1997).

A Knowledge-Based View of Environmental Performance in Cultural Context

Figure 1 contains our conceptual model relating knowledge-based views of the firm, culture, and environmental performance. Knowledge-based competence refers to having tangible resources for environmental management and both generalist and specialist knowledge of environmental management (Christensen, 1996; Knudsen, 1996; Kogut & Zander, 1992; Nanda, 1996; Teece et al., 1997). Corporate culture refers to the commitment of top management to the development of environmental knowledge and performance as well as a recognized environmental culture (Fiol, 1991, Ouchi & Wilkins, 1985; Winn, 1995). Environmental performance refers to compliance, innovation, and adoption of international certification standards (Wood, 1991; Stead & Stead, 2000).

Insert Figure 1 about here

Resources and Knowledge for Environmental Management. In the resource-based view of the firm (RBV), valuable, rare, inimitable, and non-substitutable items are a source of sustainable competitive advantage (Barney, 1991: 112). Tangible resources in the form of funds or physical property are the most easily imitated or substituted items, even if they are valuable and, at times, rare (Dierickx & Cool, 1989; Itami, 1987). Less tangible items in the form of embedded, tacit knowledge are the least easily imitated and substitutable items, and generate advantage if they are also rare and valuable (Conner & Prahalad, 1996; Leonard-Barton, 1992). The creation and application of knowledge involves identity, learning, discourse and communication, all of which are difficult to separate and contract for explicitly (Kogut & Zander, 1996; Nonaka, 1994). Miller and Shamsie (1996) have shown that both discrete knowledge — knowledge that is divisible, such as individual writers and directors — and systematic knowledge — knowledge which is not divisible, such as coordinating a movie production —are both sources of competitive advantage under high uncertainty, and they are more influential on performance than rights over property, such as assets.

Hart (1995) has theorized that resource-based theory applies to environmental management in the firm, even though environmental management is often viewed primarily as a necessary evil, a cost, a constraint on competitive advantage (also see Porter and van der Linde, 1995). Klassen and Whybark (1999) have linked investments in environmental technologies to environmental performance in manufacturing — but they did not include innate resource and knowledge factors. Recently, Millistein, Hart, and Ilinitch (2002, forthcoming) have provided some evidence that tangible investments in environmental management systems within the firm will also lead to improvements in environmental performance, particularly by reducing firms' pollution levels. In other words:

H1: The more resources are available for environmental management, the higher the firm's level of environmental performance.

The nature and impact of intangible resources for environmental performance are receiving increasing attention in the strategic and environmental management literatures. Sharma (2000) recently studied the importance of "discretionary slack" (Sharfman, Wolf, Chase, & Tansik, 1988) for voluntary corporate environmental initiatives. Discretion refers to "latitude of managerial action" (Hambrick & Fikelstein, 1987; Sharma, 2000: 684), and slack refers to the "resource that enables an organization both to adjust to gross shifts in the external environment with minimal trauma, and to experiment with new postures in relation to that environment" (Bourgeois, 1981: 31). Sharma argues that discretionary slack leads managers to frame the environment in terms of opportunities (rather than threats), which in turn leads to more proactive environmental initiatives. Using structural equation analysis of 99 Canadian companies, he also provides some evidence that discretionary slack has a mediating, enabling impact on managers' framing of environmental issues, which in turn leads to more voluntaristic environmental initiatives at the firm level.

Sharma's discretionary slack is a managerial level construct that involves the recognition and activation of slack by managers. Our notion of environmental knowledge involves the development and accumulation of tangible resources and knowledge for environmental management at the firm level, yet does not automatically imply managerial discretion for their use. In other words, we acknowledge that slack in the form of tangible resources contributes to higher performance, but we focus on developing the notion of intangible resources, which includes knowledge and the mechanisms through which knowledge affects environmental performance (Nanda, 1996; Boisot, 1995).

Generalized and specialized knowledge assets. In our view, knowledge about environmental management may be more general and widespread within a firm, or more specialized and focused (Nanda, 1996; Nonaka, 1994; Grant, 1996a). Generalized knowledge exists across parties in the form of awareness of issues and company policy, knowledge about environmental management procedures, and agreement that following them is important (Chinander, 2001; Grant, 1991; Fiol, 1991; Lindman, Callarman, Fowler, & McClatchey, 2001). In contrast, more specialized knowledge resides in functional specialists and in particular operating areas in the firm. The standards and practices of environmental management require the use of this technical knowledge, but such technical knowledge is not easily created or purchased (Lipman & Rumelt, 1982; Grant, 1996a; Nelson & Winter, 1982; Reed & De Fillippi, 1990).

When a firm has valued environmental activities and has performed well in the past, it accumulates generalized knowledge assets about the environment. The diffuse, general nature of such knowledge makes it difficult for other firms or departing members to duplicate those assets (Dierickx & Cool, 1989). Generic skills may combine to develop specialized capabilities (Bowen et al., 2001; Cramer 1996; Winter, 1987). Firms may also choose to invest internally in specialized knowledge assets and to create unique technical knowledge rather than purchase it from outside venues (i.e. environmental consultancy firms). For example, firms develop rules and procedures that guide environmental decisions and help managers evaluate environmental performance. These rules and procedures become valuable for the firm, along with being rare and not easily imitated (bought) or substituted for, only when firms have formal authority structures in place and when the input of environmental specialists is incorporated into operations (Harland, Lamming & Cousins, 1999). Functional integration between environmental specialists and other managers facilitate cooperative recycling strategies (Den Hond, 1996), the development of cleaner technologies (Carter, Ellram, & Ready, 1998). We hypothesize that both generalized and specialized knowledge will lead to competitive advantage in the environmental arena for the firm:

H2: The more generalized knowledge assets that a firm has accumulated, the higher the firm's environmental performance.

H3: The more specialized knowledge assets that a firm has accumulated, the higher the firm's environmental performance.

Relationships of Resources and Types of Knowledge. The theoretical development of the knowledge-based view with RBV and studies such as Miller and Shamsie's (1996) maintain that knowledge is a greater source of competitive advantage than tangible resources, particularly under conditions or periods of uncertainty. While the direct effects of resources on performance have been discussed and tested, fewer RBV researchers have considered the impact of these tangible resources on the development and accumulation of knowledge assets (Nanda, 1996; Knudsen, 1996). Nanda (1996: 112) has noted that "resource-driven decisions are strategic only in the medium term […] the crucial long-term decisions concern competencies". However, the general presumption seems to be one taken from the technology and innovation literature (Nadler, Tushman & Nadler, 1996; van de Ven & Poole, 1995; Damanpour, 1991) that resources enable the development of knowledge in the form of new innovations and new systems for R&D. We hypothesize that:

H4: The more resources devoted to environmental management by a firm, the greater a) the generalized and b) the specialized knowledge assets of the firm.

Generalized and specialized assets are also related to one another, but knowledge based theory is not very clear on their relationship. Miller and Shamsie (1996) have maintained that systematic and discrete forms of knowledge had independent effects on performance and implied that both were essential for successful movies. Generalized knowledge of environmental management throughout the firm could encourage the development of specialized knowledge of environmental management procedures in the firm, and specialized knowledge in the firm about environmental procedures and/or their use by technical specialists could lead to further development of generalized knowledge (Hendlund, 1994; Nonaka, 1994). That would be the ideal scenario. However, generalized knowledge might be based only on the adoption of general policies and practices about environmental management — bureaucratic practices — many of which would come outside the firm. In addition, specialized knowledge, like the technical specialists who use it, could be isolated from general operations and management. We anticipate that there will be a moderate, positive relationship between generalized and specialized knowledge in a firm. This relationship may be attributable to common causes (e.g. factors that influence the development of both types of knowledge and their use over time, such as firms' environmental culture, its prior environmental performance, external demands driven by the visibility of the firm and the cleanness/dirtiness of its sector; King & Lenox, 2000).

Adding in Culture

The resource-based view has been criticized for ignoring contextual factors and environmental dynamics (Foss, 1996; Nanda, 1996; Priem & Butler, 2001a, 2001b). Foss calls for the incorporation of the insights from RBV into other existing theories of the firm (1996: 475). Culture can also be an important contextual factor. Barney's original theory of competitive advantage was built upon the notion that advantage covaried with the ability to build inimitable, core competencies (Barney, 1986; 1989; 1991). Proactive corporate cultures foster the development of capabilities (Sharma & Vredenburg, 1998; Teece et al., 1997). Competencies that are built into supporting corporate cultures are the most difficult of all to duplicate (Barney, 1986) because they are tightly integrated with firms' strategies and require cross-functional collaborations (Den Hond, 1996; Harland et al., 1999). Kanter (1989) has developed several case studies to show how knowledge enabled innovation (also see Tichy, 1982). Systematic studies of competencies (Amit and Shoemaker, 1993) and culture (Smircich, 1983) have also linked corporate culture to performance. Therefore, we hypothesize:

H5: The more environmentally focused the company's culture, the more likely it will a) devote resources to the environment; b) have high levels of generalized knowledge assets; and c) have high levels of specialized knowledge assets.

H6: The more environmentally focused the company's culture, the higher the company's environmental performance.

Recently, authors have turned towards the role of knowledge and environmental management in global corporations and across countries (Bartlett & Goshal, 1988; Christmann & Taylor, 2001; Kanter, 1989; Teigland et al., 2000). They have argued that developing knowledge is critical for competitive advantage across borders, and that any company involved in world market must develop its knowledge-based assets to compete. Autio, Sapienza, and Almeida (2000) have examined context in terms of industry lifecycle and country of origin. They found that knowledge intensity (investment in knowledge assets) conferred competitive advantages to entrepreneurial firms in Finland that were trying to expand internationally, but inimitability did not uniformly confer advantages as firms matured. In the case of environmental management, Bansal and Roth (2000) provided evidence that Japanese and British firms became responsive to ecological issues (went green) because of competitiveness. They also showed that firms' environmental performance increased not just due to market pressures, but also institutional pressures to be more legitimate and responsible. Therefore, we anticipate:

H7: Supportive corporate cultures, resources for and knowledge of environmental management and environmental performance will be positively linked in countries highly dependent on innovation and market leadership to compete internationally.

Of course, even among such countries, there will be some variation in how tightly knowledge, resource, and environmental performance are linked. The relative importance of resources, generalized knowledge, and specialized knowledge in triggering higher environmental performance may also vary across national contexts. Culture theorists have long argued that countries can be described by a set of cultural dimensions, and that each country has somewhat different values on these cultural dimensions (national cultural norms, Hofstede, 1991; Trompennars, 1993). Past work on national culture has focused on the most obvious differences, those between the East and the West (Hofstede, 1984; 1991; Van de Vijver & Leung, 1997). Even if countries in both spheres compete on world markets, how they configure the relationships among corporate culture, resources, and knowledge could be expected to differ due to finer-grained differences in their underlying cultural norms. We do not have data on a large number of countries, with different cultural norms, and we cannot test explicitly the impact of national context on corporate environmental actions. However, we think that the contrast of East and West is worth exploring with the available data from three countries (Japan, China, and

Canada). We expect that differences in national cultures between these three countries (Hofstede, 1991; Hoecklin, 1995; Trompenaars, 1993) will lead to different environmental actions at the firm level – Canadian, Japanese, and Chinese firms may differ in noticeable ways in the strength of the hypothesized linkages between environmental resources, knowledge, and performance. Anecdotal data about environmental management suggests that, of the three countries, China might be expected to have the weakest set of relationships among corporate culture, resources, knowledge and performance (Amsden, Liu, & Zhang, 1996; Jennings & Zandbergen, 1995; World Bank 1997; Zhang, et al., 1999). However, recent work questions the assumption of East-West differences and maintains that, even if cultures for each country may be unique, increasingly global market forces are making them more similar (Begin,1997; Christmann & Taylor, 2001; Hampden-Turner & Trompenaars, 1993).

Other Important Contextual Factors. Priem and Butler argue that industries, sectors, and market changes need to be incorporated into RBV models (2001a: 29-31). Miller and Shamsie (1996) demonstrate the effect of knowledge-based assets in uncertain environments. In this study, we control for several contextual factors by incorporating size and industry sector as variables. Size normally has a positive effect on environmental performance (Ullman, 1985), because larger firms are more visible, receive stronger pressures for environmental performance from various stakeholders, and are likely to have more internal resources available for environmental initiatives. Size also serves as a proxy for a firms' need for legitimation and its sensitivity to reputation damages (Deephouse, 1996; Getz, 1995; Waddock & Graves, 1997). Sector represents a general control for differences in competition, uncertainty and technology, as well as for the types and intensity of environmental challenges faced by individual firms (King & Lenox, 2000; Lyon & Maxwell, 2000; Russo & Fouts, 1997).

DESIGN AND METHODS

To test our hypotheses, we collected survey and interview data on companies in Canada, Japan and China, and, based on Figure 1, we build a structural equation model to test these hypotheses in AMOS.

Samples and Survey Instrument

The Canadian sample was randomly chosen from the Dun and Bradstreet Database. The CEOs of nine hundred firms, from nine manufacturing and service industries, were pre-contacted by phone. Following their acceptance to participate in the study, surveys were mailed to 761 firms. After two additional phone follow-ups, executives from 291 firms returned completed surveys, accounting for a total response rate of 38.4%.

The Japanese sample was randomly selected from the First Section of the Tokyo Stock Exchange. The initial data pool consisted of 600 Japanese manufacturing firms. We mailed personally addressed questionnaires to either a senior manager or an environmental manager at each firm. One hundred and ninety three completed questionnaires were returned, accounting for a response rate of 32%.

The Chinese firms were chosen randomly from the "List of Large and Medium Shanghai Enterprises" compiled by the Shanghai Municipal Government. The initial data pool consisted of 300 manufacturing firms. To avoid mail problems, we delivered and collected the questionnaire personally to each firm. Thirty research assistants, all senior students in Management Sciences assisted in the delivery of the forms. Either a senior manager or an environmental manager from each firm personally completed the survey. As an additional check, we asked all the Chinese executives participating in our study to formally endorse their responses, by applying their corporate seal on the closed return envelope of each completed response. Two hundred and twenty four completed questionnaires were obtained, for a response rate of 74.6%.

Survey Instrument. The initial version of the survey was formulated in English and then translated into Chinese and Japanese, using the back-translation method (Brislin, 1983). The Chinese questionnaire was pre-tested on 20 Chinese senior managers enrolled in a Chinese-German Executive Training Program in the Management School of Shanghai Jiao Tong University.

The questions were developed based on issues suggested by (Albrecht, Hoiber & Nowak, 1982; Dunlap & Van Liere, 1978; Hunt & Auster, 1990; Flannery & May, 1994; Post & Altman, 1992) and revised by a team of Canadian, Chinese, and Japanese researchers. In an effort to minimize social desirability biases (Van de Vijver and Leung, 1997), several of the items assessing were negatively worded and then reverse-coded. Each question was assessed on a

Likert-type five-point scale, with verbal anchors from 1, "strongly disagree", to 5, "strongly agree".

Models and Measures

Our structural equation model is presented in Figure 2. The model hypothesizes that Environmental performance will be affected by resources, generalized knowledge, and specialized knowledge, all of which are affected by corporate culture and contextual factors (firms' size, sector, and prior environmental performance). We test the fit of the hypothesized model to the data obtained with our survey from Canadian, Japanese, and Chinese firms.

Insert Figure 2 about here

Environmental Performance. The models include three facets of firm-level environmental performance: regulatory compliance ("Our environmental protection activities are initiated primarily to comply with legislation"), environmental innovation ("Our environmental specialists actively look for technical improvements to respond more efficiently to environmental innovation"), and ISO 14001 certification (Boons, Baas, Buoma, Groene, & Blansch, 2000; King & Lenox, 2001; Nehrt, 1998; Rugman & Verbeke, 1998; Sanchez, 1997). The ISO 14001 standard was chosen for its international recognition and applicability across the different industries included in our study (Roht-Arriaza, 1997). The certification variable represented the number of years taken to complete the official ISO 14001 certification, from the time of the survey until firms' formal registration on the WorldPreferred website. We collected the certification data in 2001, using four categories: 1) three years or more from the time of responding to the survey[1]; 2) one to three years; 3) one year or less; and 4) certified prior to 1999 and continues to increase its voluntary commitments to environmental protection.

These three different operationalizations of environmental performance allow us to discriminate between reactive and proactive performance (Henriques & Sadorsky, 1999; Carroll, 1979; Roome, 1992). Firms engaging in environmental actions primarily due to minimal regulatory compliance adopt a reactive posture. Those pursuing environmental innovations show

[1] These firms were <u>not</u> officially registered by 2001.

a proactive posture. Firms may engage in ISO 14001 to signal and to obtain external validation for their commitment to continuously improve their environmental practices. In addition, the complex relationship between resources, knowledge, culture and environmental performance may depend on the measure of environmental performance used (Rothenberg et al., 2001).

Knowledge-Related Factors. The model includes three predictors of environmental performance: resources, general knowledge, and specialized knowledge. **Resources** reflect firms' internal capacity to undertake environmental initiatives. We measured this variable with one question --"Our organization has sufficient resources to implement environmental protection activities".

General Knowledge captures the degree of internal awareness and agreement regarding environmental projects (Bowen et al., 2001; Dierickx & Cool, 1989). Internal awareness may facilitate the implementations of environmental strategies, technologies, and innovations (Chinander, 2001; Christman, 2000). Strategic consensus also has a positive influence on overall manufacturing performance (Lindman, Callarman, Fowler, & McClatchey, 2001). Two questions assessed general knowledge. The first one referred to environmental awareness ("People in my organization are very aware of the need to protect the environment") and the second one to respondents' agreement with firms' environmental responses ("There is no consensus in my organization about the desirable level for environmental protection", reverse coded). We then computed a non-compensatory indicator of general knowledge by multiplying the awareness and agreement scores for each respondent.

Specialized Knowledge refers to the formal structure and the integration of the input of environmental specialists into firms' operations (Carter et al., 1998; Den Hond, 1996; Harland et al., 1999; Miller & Shamsie, 1996). We collected two separate measures of specialized knowledge, one for internal environmental expertise ("Environmental actions are frequently delegated to technical specialists or outside consultants with sufficient authority/expertise") and a different one for operational authority ("Operational changes require the input of environmental specialists in our firm"). We then computed a non-compensatory indicator of general knowledge by multiplying the expertise and authority scores for each respondent.

Corporate Culture. Corporate culture depends on the values promoted by top managers and recognized by organizational members (Deal & Kennedy, 2000; Cameron & Quinn, 1998; Schein, 1997). We use two indicators to measure firms' **corporate environmental culture**: 1.

"Many top level managers in my organization are personally and actively involved in developing environmental protection policies and monitoring their implementation" and 2. "Environmental protection is an integral part of my organization's culture".

Contextual Factors. In **mature sectors** the norms of environmental performance are clear and reinforced by a closely connected network of regulatory agencies (Greenwood & Hinings, 1996). Firms operating in more polluting sectors receive stronger stakeholder pressures (Getz, 1995), face more stringent regulatory requirements, and incur higher compliance costs (King & Lenox, 2000). We grouped respondent firms, using their main industry and industry-average pollution levels, into three sectors: light (1), medium (2), and high (3) pollution.

Larger firms are more visible and attract more attention from regulators and stakeholder groups (Getz, 1995; Henriques & Sadorsky, 1996: 385). Larger firms may also have more financial resources and internal abilities (knowledge and expertise) for implementing environmental protection activities (Simonin, 1997). We used total employment as a measure of firm size, we grouped respondent firms into three categories: 1) less than 500 employees; 2) between 500 and 2000 employees; and 3) more than 2000 employees.

The **prior record** of environmental performance was measured by one question: 'The record of my organization on environmental protection is significantly better than other organizations in our industrial sector". Firms that have achieved high levels of environmental performance in the past are more likely to have acquired a set of resources and skills that maintains and stimulates good environmental performance (Den Hond, 1996; Klassen & Whybark, 1999; Russo & Fouts, 1997; Teece et al., 1997).

Analyses and Assertions

Separate structural equation models were estimated for Canada, Japan, and China, using the AMOS 4.0 statistical software package. We first developed and tested a structural equation model for the Canadian sample, a venue where both environmental management and a firm's environmental sensitivity are recognized. Then, we tested the same model in Japan, which is well recognized for its environmental concern (Hair, Anderson, Tatham, and Black, 1998, Hayduk, 1987, 1996). Finally, we tested a very similar but shorter model[2] in China, a country

[2] One firm-level performance, the ISO 14001 registration on http://www.worldpreferred.com, was not available for China, where no companies were registered in the three years following the data collection.

that is just joining the world economy and polity, and where firm level environmental management has emerged in the 1990s and is gradually gaining emphasis (World Bank, 1997; Zhang et al., 1999).

The measurement assertions were identical across all models and shown in Table 1. The scale of measurement for firms' environmental culture construct was fixed by setting the Λ_y for its two indicators at 1.0. The error variances were estimated for both indicators. The remaining concepts were assessed with single indicators. The scales of measurement for the remaining concepts, which were assessed with single indicators, were fixed by setting the corresponding Λ_x and Λ_y at 1.0 and by specifying the magnitude of the measurement error variances for each indicator[3] (Hayduk, 1987).

Insert Table 1 about here

RESULTS

Table 2 has the means, standard deviations and correlations among the variables included in the model. About half of the correlations are significant at p=.05, indicating moderate relationships amongst the variables included in the models (ranging from .121 to .531).

Insert Table 2 about here

Table 3 contains the standardized effects (Betas) for the Canadian, Japanese and Chinese samples. The general fit of the models is contained in Table 4. In Canada, Hypothesis 1, which suggests that more resources would lead to better environmental performance, is not supported.

[3] For the indicators of firm's size, sector, and prior environmental performance, we specified a low level of measurement error. Their error terms were fixed at 5% of their variance. Because we expected a slightly higher level of bias in managers' reports of indicators (Resources, General Knowledge and Specialized Knowledge) and of their firms' environmental performance variables (Minimal Regulatory Compliance, Proactive Improvement, and ISO 14001 Certification), we fixed their measurement errors at 10% of the variance. Specified error variances were computed separately for the Canadian, Japanese, and Chinese samples, by multiplying each indicator's variance by the expected percentage of its measurement error. The fit of the models and the magnitude of the reported effects were not sensitive to these measurement specifications (they did not change significantly when halving or doubling the measurement errors for each construct, Hayduk, 1987).

Resources have a weak positive influence on regulatory compliance (Beta=.087, ns) and on certification (Beta=.109, ns). This finding suggest that not having sufficient resources may jeopardize firms' ability to comply with regulations, or with external voluntary standards, but does not stimulate internal search or implementation of better environmental solutions.

Insert Table 3 about here

In Canada, Hypothesis 2, which proposed that firms with more generalized knowledge assets would have better environmental performance, is also not supported. For Canadian firms, general knowledge has only a small positive influence on all types of environmental performance (Beta=.087, n.s. on regulatory compliance, Beta=.104, n.s. on environmental innovation, and Beta= .121, n.s. on ISO 14001 certification). The magnitude of these effects is also very similar, suggesting that general knowledge may operate as a support for firms' environmental performance (irrespective whether the firms is adopting reactive or proactive responses, Hunt & Auster, 1990).

However, in Canada, Hypothesis 3, which suggested that the more specialized knowledge assets that a firm accumulates, the higher its environmental performance, is supported. For Canadian firms, specialized knowledge has a weak positive influence on compliance (Beta=.147, n.s.) and a very strong positive influence on environmental innovation (Beta=.571, $p<.01$). These results underscore the important role played by internal capabilities in the implementation of environmental actions, and in particular for firms' internal voluntary initiatives. Interestingly, the greater the specialized knowledge in the firm, the longer Canadian that firm has taken to become ISO 14001 certified (Beta=-.118, ns). This reverse relationship between specialized knowledge and certification may be driven by contextual factors that shape both firms' need or ability to accumulate specialized knowledge and its need or willingness to pursue external certification. For example, larger firms, operating in more polluting sectors, or with a poor record of environmental performance, are more likely to develop specialized environmental knowledge. However, due to the complexity of their operations, and/or greater scrutiny by multiple stakeholders, they may take longer to meet the requirements for certification. Smaller firms, firms operating in clean sectors, or firms with a good record of environmental performance may not need to develop specialized knowledge skills, and they may also find it easier to meet the demands of external certification schemes.

In Canada, Hypothesis 4, which suggested that firms with more internal resources have a greater ability to accumulate general and specialized knowledge, is not supported in the direction anticipated. Resources have a negative effect on the accumulation of general knowledge (Beta=-.164, ns). While non-significant, this negative relationship between resources and general knowledge suggests an interesting interpretation. When firms do not have sufficient resources to ensure good environmental performance, the may strive to develop internal capabilities to make better use of their available resources. In other words, resources and general knowledge may offer complementary avenues to improve environmental performance. For example, firms can invest in cleaner production equipment or technologies, or they may develop growing internal awareness and agreement about the ways they could reduce, or prevent, waste and pollution. In our Canadian sample, the availability of tangible resources has a very small, and non-significant influence on the development of specialized knowledge (Beta=.049, ns). This lack of a strong relationship between resources and specialized knowledge is intriguing. It suggests that being large or rich does not necessarily mean knowing better how to use the slack resources for the benefit of the environment. Instead, resources and specialized knowledge may offer two distinct, and complementary paths to improve environmental performance: one can invest more resources in equipment and in the formal structure and informal internal networks for environmental decision making. However, taking both routes may allow firms to achieve higher levels of environmental performance, or increase their level of environmental performance faster.

In Canada, hypothesis 5, which proposed that culture influences the resources dedicated to environmental protection and stimulates the development of generalized and specialized knowledge assets, is largely supported. Corporate culture has a significant positive effect on resources (H5a supported, Beta=.637, $p<.05$), on the development of general knowledge (H5b supported, Beta=.931, $p<.05$), and on the accumulation of specialized knowledge (H5c supported, Beta=.630, $p<.05$). These findings show that the development of an environmental culture stimulates both the accumulation of tangible assets (if the context permits) and knowledge assets.

However, in Canada, Hypothesis 6, which suggested that corporate culture affects firms' environmental performance directly, is not supported. Corporate culture has a negative effect on regulatory compliance (Beta=-.432, n.s.), suggesting that firms with a stronger corporate commitment to environmental issues are less likely to implement environmental reasons due to coercion. Culture also has a negligible influence on environmental innovation (Beta=.01, ns), suggesting that the effect of culture on environmental innovation is fully mediated by the internal development of specialized knowledge assets. Corporate culture has only a small negative effect on certification (Beta=-.136, ns), suggesting that firms with a more proactive internal orientation may take longer to pursue external certification. This unexpected finding could reflect the fact that proactive firms have a lower need to prove their proactiveness to stakeholders. Instead, these firms may show their proactiveness internally, by allocating more resources, by developing greater awareness and consensus, and by entrusting environmental tasks and authority to qualified professionals/ specialists.

Comparative Tests of the Culture-Knowledge-Performance Linkages

The overall fit of the model for Canadian, Japanese, and Chinese firms is reported in Table 4. The model fits well in each of the three countries (p>.10, GFI>.977, AGFI>.912, and RMSEA<.048 with a 90% confidence interval including 0). The fit of these country-models suggests that firms' resources and knowledge influence their environmental performance in Canada, Japan, and Canada, supporting Hypothesis 7.

Insert Table 4 about here

Using a sequence of nested stacked models (Bollen, 1989; Hayduk, 1987, 1996), we also tested if the relationships hypothesized in H1-H6 were similar in magnitude across countries. Because the certification measure was not available for China, we used two different sequences of stacked models: one for Canada and Japan including the certification variable (Model I) and a second one without the voluntary certification variable for Canada, Japan, and China (Model II).

The unconstrained stacked models provides a simultaneous test for *the presence* of similar relationships between the variables of interest. The goodness of fit statistics shown in Table 4 confirm that the unconstrained model fits well in all three countries (Model I, p=.068, GFI=.983, AGFI=.922, RMSEA=.036 with a 90% confidence interval between .020 and .050; Model II, p=.158, GFI=.986, AGFI=.945, RMSEA=.037 with a 90% confidence interval between

.027 and .046). However, the constrained model, which restricted all the hypothesized effects to be *equal in magnitude* across countries, does not fit the data well, and shows a significant worsening in model fit over the unconstrained model. These results suggest that the direction and/or magnitude of the hypothesized relationships is significantly different across countries.

For both Canadian and Japanese firms, resources have very small positive effects on regulatory compliance (Beta=.066, n.s.). In contrast to Canada, in Japan, resources have a positive effect on firms' environmental innovations (Beta=.074, n.s.), and slightly slowed down external certification (Beta=-.055, n.s.). The lack of adequate resources may trigger actions of external legitimation, whereas the presence of sufficient resources creates an internal mandate for increased compliance and for additional environmental innovation. Japanese firms with greater general knowledge are slightly more likely to pursue environmental innovations (Beta=.139, n.s), and less likely to focus on mere compliance (Beta=-.099, n.s) or on external certification (Beta=-.012, n.s). In Japan, specialized knowledge has strong effects on environmental performance. It stimulates both compliance (Beta=.472, p<.05) and innovation (Beta=.384, p<.05). Specialized knowledge is also inversely related to the length of time firms have taken before becoming ISO 14001 certified, suggesting that firms may be more likely to develop greater specialized knowledge under adverse circumstances. In other words, the conditions that prompt or facilitate the accumulation of specialized knowledge also make it harder for the firm to meet the certification standards (e.g. complexity, specificity, outdated technologies etc.). In Japan, resources facilitate the development of general knowledge (Beta=.153, p<.05) and have a small positive influence on specialized knowledge assets (Beta=.026, n.s). Firms with more proactive corporate cultures are more likely to have sufficient resources (Beta=.347, p<.05), general knowledge (Beta=.586, p<.05) and specialized knowledge (Beta=.844, p<.05). Moreover, corporate culture has a strong negative influence on regulatory compliance (Beta=-.728, p<.05) and a strong positive effect on ISO 14001 certification (Beta=.875, p<.05). This suggests that firms with proactive corporate cultures are unlikely to take environmental reasons simply in order to comply with regulatory compliance. However, these firms are more likely to seek external validation of their cultures by voluntarily committing to meet certification standards. As in Canada, the effects of corporate culture on environmental innovation were fully mediated by specialized knowledge. In Japan, corporate culture and specialized knowledge also have opposite effects on regulatory compliance (culture decreases, while specialized knowledge increases the likelihood that firms initiate environmental actions for compliance reasons) and on the speed of certification (culture increases, while specialization decreases the length of time until certification).

In China, resources have a negative impact on minimal regulatory compliance (Beta=-.214, p<.05) and a positive impact on environmental innovation (Beta=.248, p<.05). Resources make a difference in the environmental performance of Chinese firms, but not for Canadian or Japanese firms. General knowledge has a small positive effect on regulatory compliance and an unexpected negative effect on environmental innovation. For Chinese firms, greater awareness and agreement is negatively related to environmental performance, and seems to be paralyzing voluntary initiatives. These results differ from those obtained in Canada and Japan, where general knowledge supports environmental innovation. Consistent with the Canadian and Japanese results, in China, specialized knowledge has a positive impact on both regulatory compliance (.208, n.s.) and environmental innovation (Beta=.287, p<.05). Interestingly, proactive corporate culture does not result in greater slack resources for environmental actions (Beta=.050, n.s.), but leads to greater general (Beta=.635, p<.05) and specialized knowledge (Beta=.725, p<.05). Proactive cultures makes it less likely that firms would undertake environmental actions merely in response to regulations (Beta=-.439, p<.05) and more likely that firms would voluntarily pursue environmental innovation (Beta=.633, p<.05).

DISCUSSION AND CONCLUSIONS

Our results provide modest support for our main argument that resources and a combination of general and technical knowledge of environmental management will improve firms' environmental performance, particularly when their national and corporate cultures endorse environmental initiatives. In the terms of knowledge-based theory, we have found that specialized knowledge of environmental management increases firms' environmental innovation in three quite different national contexts -- Canada, Japan and China. Specialized environmental knowledge also increases the level of regulatory compliance for Japanese firms. Our findings suggest that specialized knowledge of environmental management may be a critical component for environmental performance, in keeping with the argument that tacit, rare, inimitable resources — usually "intangible" ones — are more likely to be linked to competitive advantage, especially sustainable performance. In contrast, we have found little evidence that generalized knowledge of environmental policy and management would be associated with higher environmental performance at the firm level. Overall, the importance of specialized knowledge in the resources-knowledge-performance relationship supports the argument that investments in specific environmental technologies and know-how improve the environmental outcomes more than non-targeted investments or general procedures for environmental management (Christmann, 2000; Klassen & Whybark, 1999). In this study, more diffused environmental knowledge was not as effective as in-depth, specific knowledge in increasing firms' voluntary environmental initiatives. Such an empirical distinction between diffuse and specific knowledge has not often been made in the knowledge management literature. These preliminary findings may stimulate additional theoretical development and further testing.

We find very limited evidence that resources for environmental management have a direct effect on the environmental knowledge or on environmental performance. Only in China, resource levels explain differences in environmental performance (regulatory compliance and environmental innovation) among firms. Resources are also associated with generalized knowledge in Japan and China, yet generalized knowledge has no direct effect on environmental performance. In Canada, resources have no effect on knowledge or performance. The overall lack of support for the importance of resources in facilitating firms' environmental performance is most surprising (Hart, 1995; Wood, 1991). We suggest an alternative explanation: resources may only make a difference in firms' environmental actions when they are scarce. Lack of sufficient resources can lower environmental performance by hampering firms' efforts to respond to environmental regulations or to implement environmental initiatives. The lack of resources observed at the firm level may be a result of contextual factors (e.g. general scarcity of resources in China, Amsden et al., 1996, World Bank, 1997; Zhang et al., 1999; versus the governmental support given to firm-level initiatives in Canada, and especially Japan), and not the consequence of internal allocation decisions. Future studies could provide more nuances on the connection between resources and environmental performance by using more objective measures of resources and multiple measures of different types of resources (e.g., see Christmann, 2000).

Knowledge-based theorists have been working on several different ways of conceptualizing context. Our focus here has been on culture, an important contextual factor affecting both knowledge assets and firms' performance (Teigland et al., 2000). We have considered two distinct levels of analysis — national culture and corporate culture, and have shown that, at each level, culture shapes firm level environmental capabilities and performance.

Corporate culture appears to be an important contextual factor for environmental knowledge and environmental performance. Having top managers involved in environmental initiatives and having organizational members recognize their company's pro-environmental culture has positive effects on resources and knowledge in Canada, Japan, and China. In Canada and Japan, the influence of corporate culture on environmental innovation is mediated by specialized knowledge, whereas in China, corporate culture also has a direct effect. We also show that the importance of corporate culture varies across national contexts. As countries endorse sustainability principles, firms tend to adjust their corporate cultures (Jennings & Zandbergen, 1995). It may be that the direct link between corporate culture and performance exhibits diminishing marginal returns: as more and more firms adopt proactive approaches to environmental issues, only those firms that manage to develop specific internal capabilities continue to improve their environmental performance.

National cultures also contain deep assumptions about the importance of the natural environment (Branzei et al., 2001; Starik and Rands, 1995; Egri and Pinfield, 1996). When the national culture nourishes harmony and balance between human activities and natural conservation, firms may be more inclined to adopt proactive environmental responses. The dimensions of national cultures may also influence the degree to which firms develop proactive cultures and shape their preference towards general or specialized knowledge (Hofstede, 1984, Trompenaars, 1993). For example, in universalistic cultures, people believe that what is true and good can be discovered, defined, and applied everywhere and focus more on specific norms and rules of practice, whereas in particularistic cultures, people consider that what is right and good depends on unique, ever changing circumstances and value relationships and flexible approaches (Hoecklin, 1995; Trompenaars, 1993). The consequence is that universalistic cultures may use technical rules for knowledge creation, which in turn promote the development of specialized knowledge. The greater reliance of particularist cultures on unique, localized rules for knowledge creation may, ironically, undercut the development of specialized environmental knowledge. According to Hofstede (1984) and Trompenaars (1993), Canada is more universalistic, China is more particularistic, and Japan falls in the middle. In our study, the effect of specialized knowledge is twice as strong in Canada as in China. Finer grained studies that link specific descriptions of national culture dimensions with firm-level environmental actions could shed additional light on the interplay between national and corporate cultures.

Of course, the relationship between national context and corporate culture is not really linear. National cultural norms may increase or decrease the levels of individual and collective responsibility towards environmental protection. Nevertheless, other socio-economic or political considerations (specific to each country or global, Christman & Taylor, 2001) may counter-balance the effect of these cultural norms. For example, firms operating in countries that compete on a world level are better able to successfully lever their environmentally friendly practices and to obtain competitive advantages. However, pro-environmental regional enclaves or specialized companies from less environmentally friendly countries can also achieve competitive advantages by adopting innovative environmental practices (e.g. Egri and Herman, 2000). Overall, national context may either strengthen or weaken firm-level environmental initiatives.

Further research on the connection between different national contexts and firm-level environmental performance is needed. However, the amorphous nature of culture as a concept makes it difficult to operationalize. Our study suggests that there are differences between the environmental content nourished by the national cultural norms, the degree to which firms within these cultures develop proactive corporate cultures, and the degree to which they develop environmental knowledge internally. On the one hand, future studies may separate the culture-knowledge relationship into a logical sequence of managerial values, intentions, internal systems, and institutional structures (Bansal and Roth, 2000; Christmann, 2000; Cordano & Frieze, 2000) — all of which lead to the creation and application of environmental management knowledge. On the other hand, the culture-knowledge relationship may be lumped together and modeled as a process through which rules for environmental knowledge management are developed, learned within a company, and then become diffused in a field or across countries (Hironaka and Shofer, 2002 forthcoming). Either avenue provides a useful research path for better capturing the influence of context, at different level of analysis, on firms' environmental performance (Starik and Rands, 1995).

FIGURE 1: A Conceptual Model – The Effects of Culture, Resources, and Knowledge on Environmental Performance

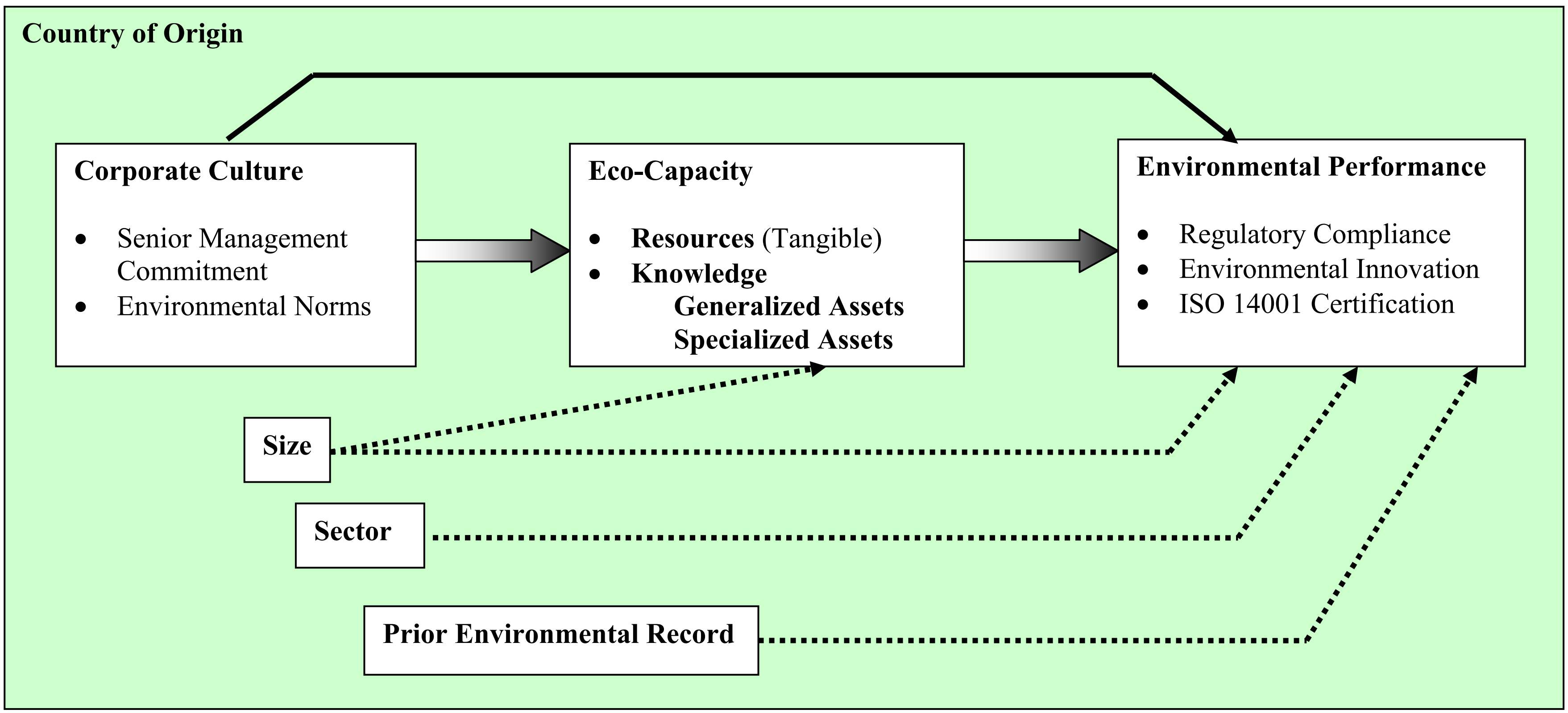
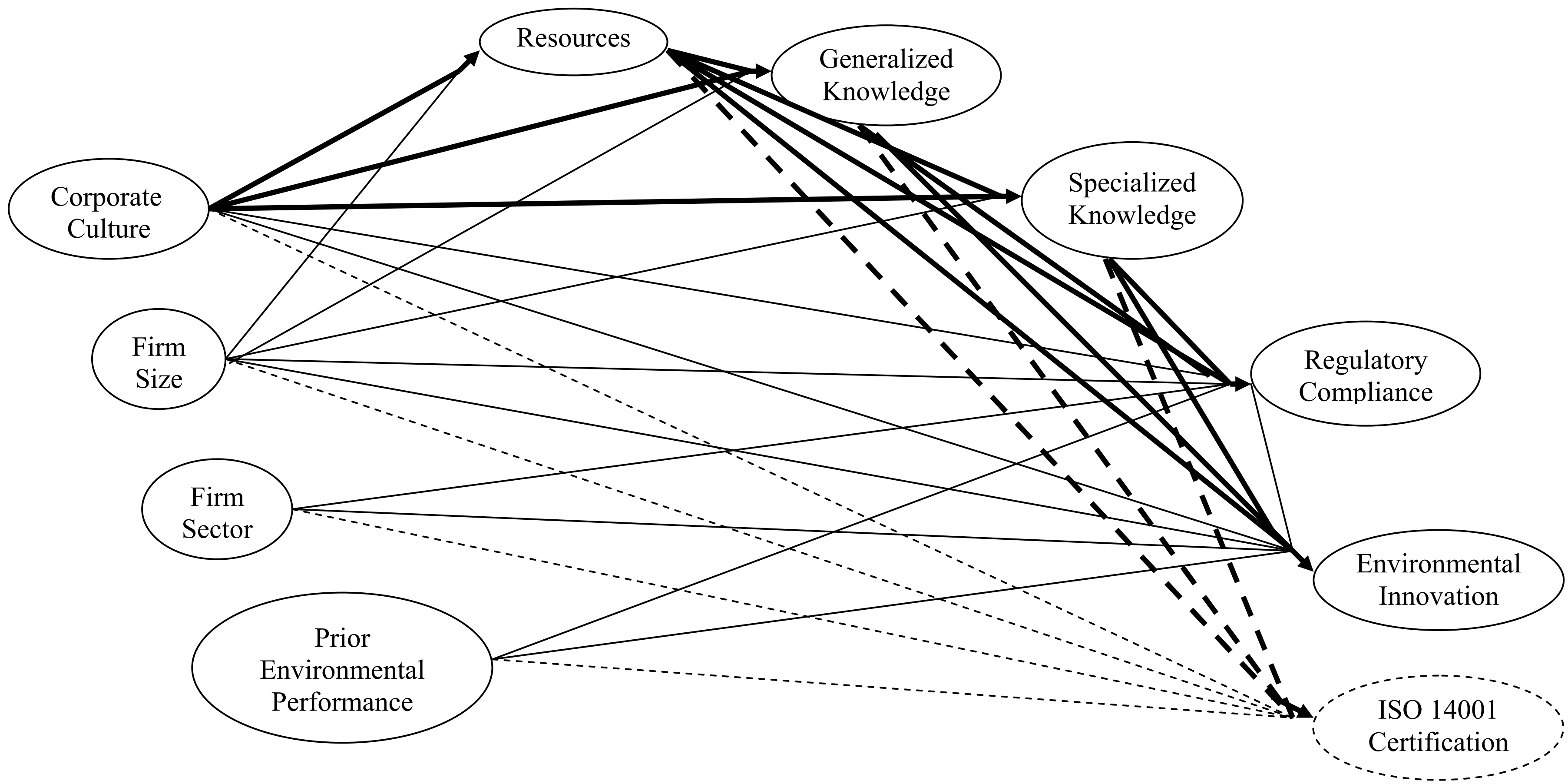


FIGURE 2: Models*



* Dotted lines are included in Model I and excluded in Model II.
All hypothesized effects are bolded.

TABLE 1: Assertion of Measurement for Models

	Mean	Variance	Range Minimum	Range Maximum	% Measurement Error Variance	TE and TD Values
Canada						
Senior Management Commitment	4.052	0.697	1	5	Free	Free
Organizational Culture	3.609	0.670	1	5	Free	Free
Firm Size	1.313	0.312	1	3	5%	0.016
Firm Sector	2.165	0.580	1	3	5%	0.029
Prior Environmental Performance	3.633	0.614	1	5	5%	0.031
Resources	3.674	0.897	1	5	10%	0.090
Generalized Knowledge	15.345	34.119	2	25	10%	3.412
Specialized Knowledge	11.955	35.760	1	25	10%	3.576
Regulatory Compliance	2.811	0.870	1	5	10%	0.087
Environmental Innovation	3.364	1.508	1	5	10%	0.151
ISO 14001 Certification	1.082	0.166	1	4	10%	0.017
Japan						
Senior Management Commitment	3.145	0.933	1	5	Free	Free
Organizational Culture	3.241	1.248	1	5	Free	Free
Firm Size	2.544	0.312	1	3	5%	0.016
Firm Sector	2.166	0.399	1	3	5%	0.020
Prior Environmental Performance	3.140	0.913	1	5	5%	0.046
Resources	3.549	1.218	1	6	10%	0.122
Generalized Knowledge	14.223	54.664	1	25	10%	5.466
Specialized Knowledge	12.492	43.147	1	25	10%	4.315
Regulatory Compliance	2.131	0.709	1	5	10%	0.071
Environmental Innovation	3.710	1.061	1	5	10%	0.106
ISO 14001 Certification	1.648	1.104	1	4	10%	0.110
China						
Senior Management Commitment	3.455	1.029	1	5	Free	Free
Organizational Culture	4.188	0.575	1	5	Free	Free
Firm Size	2.263	0.338	1	3	5%	0.017
Firm Sector	2.156	0.536	1	3	5%	0.027
Prior Environmental Performance	3.375	1.186	1	5	5%	0.059
Resources	2.737	1.361	1	5	10%	0.136
Generalized Knowledge	11.205	27.482	1	25	10%	2.748
Specialized Knowledge	14.558	36.732	2	25	10%	3.673
Regulatory Compliance	3.037	1.288	1	5	10%	0.129
Environmental Innovation	3.830	0.850	1	5	10%	0.085
ISO 14001 Certification	NA	NA	NA	NA	NA	NA

TABLE 2: Means, Standard Deviations, and Correlations

	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12	13
Canada															
1. Senior Management Commitment (Corporate Culture)	4.052	.835	1.000												
2. Organizational Culture (Corporate Culture)	3.609	.819	**.449**	1.000											
3. Firm Size	1.313	.559	.098	**.171**	1.000										
4. Firm Sector	2.165	.761	.094	**.121**	.097	1.000									
5. Prior Environmental Performance	3.633	.783	.069	.067	.046	**.146**	1.000								
6. Resources	3.674	.947	**.387**	**.428**	.109	**.142**	**.386**	1.000							
7. Awareness (Generalized Knowledge)	4.055	.853	**.499**	**.340**	.022	**.166**	**.252**	**.291**	1.000						
8. Agreement (Generalized Knowledge)	3.725	.990	**.467**	**.431**	**.184**	**.150**	**.458**	**.347**	**.285**	1.000					
9. Technical Expertise (Specialized Knolwedge)	3.797	.970	**.442**	**.458**	**.149**	**.209**	**.298**	**.479**	**.280**	**.390**	1.000				
10. Operational Authority (Specialized Knowledge)	3.062	1.185	**.289**	**.294**	**.148**	**.134**	**.265**	**.279**	**.307**	**.238**	**.287**	1.000			
11. Minimal Regulatory Compliance	2.811	.933	-.052	-.072	.035	-.011	-.113	-.016	.024	-.079	-.020	.052	1.000		
12. Proactive Improvement	3.364	1.228	**.398**	**.345**	**.160**	**.127**	**.320**	**.331**	**.405**	**.318**	**.444**	**.577**	.026	1.000	
13. ISO 14001 Certification	1.082	.407	-.074	.045	-.068	.045	.016	.043	.007	.014	.025	-.082	.023	-.060	1.000
Japan															
1. Senior Management Commitment (Corporate Culture)	3.145	.966	1.000												
2. Organizational Culture (Corporate Culture)	3.241	1.117	**.464**	1.000											
3. Firm Size	2.544	.558	.141	.115	1.000										
4. Firm Sector	2.166	.632	**.189**	.096	.053	1.000									
5. Prior Environmental Performance	3.140	.955	**.456**	**.355**	**.198**	.117	1.000								
6. Resources	3.549	1.103	**.240**	**.254**	**.223**	-.027	**.233**	1.000							
7. Awareness (Generalized Knowledge)	3.839	1.354	**.451**	**.429**	**.275**	.123	**.396**	**.303**	1.000						
8. Agreement (Generalized Knowledge)	3.518	1.155	**.286**	**.284**	**.231**	.139	**.269**	**.327**	**.460**	1.000					
9. Technical Expertise (Specialized Knolwedge)	3.394	1.155	**.497**	**.561**	.094	.124	**.412**	**.250**	**.467**	**.350**	1.000				
10. Operational Authority (Specialized Knowledge)	3.497	1.132	**.454**	**.458**	.097	.132	**.282**	**.289**	**.416**	**.331**	**.479**	1.000			
11. Minimal Regulatory Compliance	2.131	.842	**-.161**	-.022	**-.190**	.011	.022	-.061	-.099	**-.268**	-.046	-.086	1.000		
12. Proactive Improvement	3.710	1.030	**.394**	**.403**	**.158**	**.154**	**.290**	**.269**	**.437**	**.210**	**.508**	**.423**	-.062	1.000	
13. ISO 14001 Certification	1.648	1.051	**.392**	**.464**	.091	-.108	**.236**	.145	**.271**	**.177**	**.149**	.126	**-.286**	.064	1.000
China															
1. Senior Management Commitment (Corporate Culture)	3.455	1.015	1.000												.
2. Organizational Culture (Corporate Culture)	4.188	.758	**.343**	1.000											.
3. Firm Size	2.263	.582	-.022	.050	1.000										.
4. Firm Sector	2.156	.732	**.175**	.125	.008	1.000									.
5. Prior Environmental Performance	3.375	1.089	**.263**	.132	.127	-.063	1.000								.
6. Resources	2.737	1.167	.053	.000	.083	-.109	.060	1.000							.
7. Awareness (Generalized Knowledge)	3.884	.930	**.455**	**.406**	.040	.020	**.304**	.042	1.000						.
8. Agreement (Generalized Knowledge)	2.835	1.018	**.290**	.116	-.017	-.019	.012	**.318**	**.207**	1.000					.
9. Technical Expertise (Specialized Knolwedge)	4.031	.854	**.496**	**.531**	.028	.042	.127	-.028	**.445**	**.212**	1.000				.
10. Operational Authority (Specialized Knowledge)	3.554	1.123	**.376**	**.194**	-.039	.102	.090	.009	**.349**	**.163**	**.244**	1.000			.
11. Minimal Regulatory Compliance	3.037	1.135	**-.149**	-.086	-.001	.069	-.027	**-.203**	.024	-.199	-.095	-.029	1.000		.
12. Proactive Improvement	3.830	.922	**.476**	**.360**	.067	.066	**.242**	**.154**	**.400**	**.147**	**.456**	**.455**	.079	1.000	.
13. ISO 14001 Certification	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Significant correlation at p=.05 (greater than .121 for Canada, .149 for Japan, and 147 for China) appear in bold.

TABLE 3: Standardized Effects in Canada, Japan, and China

	Resources	Generalized Knowledge	Specialized Knowledge	Regulatory Compliance	Env. Innovation	ISO 14001 Certification
Canada						
Corporate Culture	.637*	.931*	.630*	-.432	.091	-.136
Firm Size	-.009	-.013	.094	.048	.010	-.065
Firm Sector				-.015	-.025	.042
Prior Env. Performance				.092	.010	.177*
Resources		-.164	.049	.087	-.006	.109
Generalized Knowledge				.195	.104	.121
Specialized Knowledge				.147	.571*	-.118
Regulatory Compliance					.028	
Japan						
Corporate Culture	.347*	.586*	.844*	-.728*	.084	.875*
Firm Size	.174*	.203*	-.055	-.163	.042	.251*
Firm Sector				.074	.074	-.219*
Prior Env. Performance				.279*	-.001	-.021
Resources		.153*	.026	.066	.074	-.055
Generalized Knowledge				-.099	.139	-.012
Specialized Knowledge				.472*	.384*	-.520*
Regulatory Compliance					.018	
China						
Corporate Culture	.050	.635*	.725*	-.439*	.633*	NA
Firm Size	.088	-.020	-.014	.010	.050	NA
Firm Sector				.106	-.049	NA
Prior Env. Performance				.069	.067	NA
Resources		.273*	-.044	-.214*	.248*	NA
Generalized Knowledge				.074	-.213	NA
Specialized Knowledge				.208	.287*	NA
Regulatory Compliance					.263*	

TABLE 4: Goodness of Fit Statistics

Model I *(with ISO 14001 certification)*	Chi square	Df	p	GFI	AGFI	NFI	CFI	RMSEA	RMSEA Lower Bound	RMSEA Upper Bound
Canada	22.644	17	.161	.986	.947	.965	.990	.034	.000	.067
Japan	24.375	17	.110	.977	.912	.952	.984	.048	.000	.087
Stacked	*46.990*	*34*	*.068*	*.983*	*.933*	*.959*	*.988*	*.028*	*.000*	*.046*
Stacked, Equality Constraints	*77.745*	*48*	*.004*	*.972*	*.922*	*.933*	*.973*	*.036*	*.020*	*.050*
Change in model fit	*30.75*	*14*	*p<.010*							

Model II *(without ISO 14001 certification)*	Chi square	Df	p	GFI	AGFI	NFI	CFI	RMSEA	RMSEA Lower Bound	RMSEA Upper Bound
Canada	17.919	14	.210	.988	.953	.972	.993	.031	.000	.068
Japan	14.438	14	.418	.985	.941	.968	.999	.013	.000	.072
China	18.779	14	.174	.984	.937	.953	.987	.039	.000	.081
Stacked	*51.142*	*42*	*.158*	*.986*	*.945*	*.966*	*.993*	*.018*	*.000*	*.033*
Stacked, Equality Constraints	*128.010*	*66*	*p<.001*	*.965*	*.914*	*.914*	*.954*	*.037*	*.027*	*.046*
Change in fit	*76.868*	*24*	*p<.001*							

REFERENCES

Albrecht, D., Hoiberg, E., and Nowak, P. 1982. 'The New Environmental Paradigm scale.' *Journal of Environmental Education*, 13: 39-43.

Amit, R., and Schoemaker, P.J.H. 1993. 'Strategic assets and organizational rent.' *Strategic Management Journal,* 14(1): 33-46.

Amsden. A.H., Liu D., Zhang X. 1996. 'China's macroeconomy, environment and alternative transition model.' *World Development*, 24(2): 273-286.

Autio, E., Sapienza, H.J., and Almeida, J.G. 2000. 'Effects of age at entry, knowledge intensity, and imitability on international growth.' *Academy of Management Journal, 43(5): 909-924.*

Bansal, P., and Roth, K. 2000. 'Why companies go green: A model of ecological responsiveness.' *Academy of Management Journal*, 43: 717-737.

Barney, J.B. 1989. 'Asset stocks and sustained competitive advantage: A comment.' *Management Science*, 35(12): 1511-1513.

Barney, J.B. 1986. 'Strategic factor markets: Expectations, luck, and business strategy.' *Management Science,* 32(10): 1231-1241.

Barney, J.B. 1996. 'Organizational culture: Can it be a source of sustained competitive advantage?' *Academy of Management Review,* 11(3): 656-665.

Barney, J.B. 1991. 'Firm resources and sustained competitive advantages.' *Journal of Management,* 17(1): 99-120.

Bartlett, C.A., and Goshal, S. 1998. *Managing across Borders: The Transnational Solution*. Boston, Mass: Harvard Business School Press.

Begin, J. P. 1997. *Dynamic Human Resource Systems: Cross-national Comparisons*, Berlin-New York : Walter de Gruyter.

Boisot, M.H. 1995. 'Is your firm a creative destroyer? Competitive learning and knowledge flows in the technological strategies of firms.' *Research Policy,* 24(4): 498-506.

Bollen, K.A. 1989. *Structural Equations with Latent Variables*. New York: Wiley.

Boons, F., Baas, L., Bouma, J.J., Groene, A.D., and Blansch, K.L. 2000. *The changing nature of business: Instutionalisation of green organizational routines in the Netherlands* 1986-1995. International Books: Utrecht, Netherlands.

Bourgeois, L.J. III. 1981. 'On the measurement of organizational slack.' *Academy of Management Review*, 6: 29-39.

Bowen, F.E., Cousins, P.D., Lamming, R.C., and Faruk, A.C. 2001. 'The role of supply management capabilities in green supply.' Production and Operations Management, 10(2): 174-189.

Branzei, O., Vertinsky, I., Takahashi, T., and Zhang, W. 2001, 'Corporate environmentalism across cultures: A comparative field study of Chinese and Japanese executives', *International Journal of Cross Cultural Management*, 1(3): 287-312.

Brislin, R.W. 1983. 'Cross-cultural Research in Psychology.' *Annual Review of Psychology*, 34: 363-400

Brown, J.S., and Duguid, P. 1991. 'Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation.' *Organization Science,* 2(1): 40-57.

Camerer, C., and Vepsalainen, A. 1988. 'The economic efficiency of corporate culture'. *Strategic Management Journal*, 9: 115-126.

Cameron, K.S, and Quinn, R.E. 1998. *Diagnosing and Changing Organizational Culture: Based on the Competing Values Framework*, Addison-Wesley Series on Organization Development.

Carroll, A.B. 1979. 'A three-dimensional conceptual model of corporate performance', *Academy of Management Review,* 4 (4): 497-505.

Carter, C.R., Ellram, L.M., and Ready, K.J. 1998. 'Environmental purchasing: Benchmarking our German counterparts.' *International Journal of Purchasing and Supply Management*, 3(4): 199-207.

Chatman, J.A., and Jehn, K.A. 1994. 'Assessing the relationship between industry characteristics and organizational culture: How different can you be?' *Academy of Management Journal,* 37(3): 522-553.

Chinander, K.R. 2001. 'Aligning Accountability and Awareness for Environmental Performance in Operations.' *Production and Operations Management*, 10(3): 276-291.

Christensen, J.F. 1996. 'Analyzing the technology base of the firm: A Multi-dimensional resources and competence perspective,' in N.J. Foss and C. Knudsen (Eds.), *Towards a Competence Theory of the Firm*. London, New York: Routledge.

Christmann, P. 2000. 'Effects of best practices of environmental management on cost advantage: The role of complementary assets.' *Academy of Management Journal*, 43(4): 663-680.

Christmann, P., and Taylor, G. 2001, 'Globalization and the environment: Determinants of firm Self-regulation in China', *Journal of International Business Studies*, 32(3): 439-458.

Conner, K.R., and Prahalad, C.K.1996. 'A resource-based theory of the firm: Knowledge versus opportunism.' *Organization Science*, 7(5): 477-501.

Conner, K.R. 1991. 'A historical comparison of resource-based theory and five schools of thought within industrial organization economics: Do we have a new theory of the firm?' *Journal of Management,* 17(1): 121-154.

Cordano, M., and Hanson Frieze I. 2000. 'Pollution reduction preferences of U.S. environmental managers: Applying Ajzen's theory of planned behavior.' *Academy of Management Journal*, 43: 627-641

Cramer, J. 1996. 'Experiences with integrated chain management in Dutch industry.' *Business Strategy and the Environment*, 5: 143-155.

Daly, H.E., and Cobb J.B, Jr. 1994. *For the Common Good*. (2nd edition). Boston: Beacon Press

Damanpour, F. 1991. 'Organizational innovation: A meta-analysis of effects of determinants and moderators.' *Academy of Management Journal*, 34: 555-590

Deal, T.E, and Kennedy, A.A. 2000. *Corporate Cultures,* Perseus.

Deephouse, D.L. 1996. 'Does Isomorphism Legitimate?' *Academy of Management Journal*, 39: 1024-1039.

Den Hond, F. 1996. 'Capabilities in corporate environmental strategy: the case of end-of-life vehicle recycling.' Paper presented at the *Annual Meeting of the Academy of Management*, Cincinnati, Ohio.

Dierickx, I., and Cool, K. 1989. 'Asset stock accumulation and sustainability of competitive advantage.' *Management Science,* 35(12): 1504-1514.

Dunlap, R.E. and van Liere, K.D. 1978. 'The New Environmental Paradigm.' *Journal of Environmental Education,* 9: 10-19.

Egri, C.P., and Pinfield, L.T. 1996. 'Organizations and the biosphere: Ecologies and environments,' in S. Clegg, C. Hardy, and W. Nord (Eds.), *Handbook of Organization Studies*: 459-483, London: Sage.

Egri, C., and Herman, S. 2000. 'Leadership in the North American environmental sector: Values, leadership styles, and contexts of environmental leaders and their organizations.' *Academy of Management Journal*, 43: 571-604.

Fiol, C.M. 1991. 'Managing culture as a competitive resource: An identity-based view of sustainable competitive advantage.' *Journal of Management,* 17(1): 191-211.

Flannery, B.L., and May, D.R. 1994. 'Prominent factors influencing environmental activities: Application of the environmental leadership model.' *Leadership Quarterly,* 5: 201-221.

Foss, N.J. 1996. 'Knowledge-based approaches to the theory of the firm: Some critical comments'. *Organization Science*, 7(5): 470-476.

Furu, P. 2000. 'Integration of Technology Competence in the MNC: The Role of Subsidiary Environment,' *Management International Review*, 40: 7-27.

Getz, K.A. 1995. 'Implementing multilateral regulations: A preliminary theory and illustration', *Business and Public Policy*. 34(3): 280.

Grant, R.M. 1991. 'The resource-based theory of competitive advantage: Implications for strategy formulation.' *California Management Review,* 33(3): 114-135.

Grant, R.M. 1996a. 'Prospering in dynamically-competitive environments: Organizational capability as knowledge integration.' *Organization Science,* 7(4): 375-387.

Grant, R.M. 1996b. 'Toward a knowledge-based theory of the firm.' *Strategic Management Journal,* 17: 109-122.

Greenwood, R., and Hinings, C.R. 1996. 'Understanding radical organizational change: Bringing together the old and the new institutionalism.' *Academy of Management Review,* 21(4): 1022-1054.

Hair, J.F., Anderson, R.E., Tatham, R.L., and Black, W. C. 1995. *Multivariate Data Analysis* (4th Edition), Englewood Cliffs, NJ: Prentice Hall.

Hall, R. 1993. 'A framework linking intangible resources and capabilities to sustainable competitive advantage.' *Strategic Management Journal,* 14(8): 607-618.

Hambrick, D.C., and Finkelstein, S. 1988. 'Managerial discretion: A bridge between polar views of organizations.' In L.L. Cummings and B.M. Staw (Eds.), *Research in Organizational Behavior,* Vol. 10: 369-406. Greenwich, CT: JAI Press.

Hampden-Turner, C., and Trompenaars, A. 1993. *The Seven Cultures of Capitalism: Value Systems for Creating Wealth in the United States, Japan, Germany, France, Britain, Sweden, and the Netherlands,* New York: Currency Doubleday.

Harland, C., Lamming, R.C., and Cousins, P.D. 1999. 'Developing the concept of supply strategy.' *International Journal of Production and Operations Management*, 19(4): 650-674.

Hart, S.L., and Ahuja, G. 1996. 'Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance', *Business Strategy and the Environment*, 5(1): 30-37.

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

Hawken, P. 1993. *The ecology of commerce: A declaration of sustainability*. New York: HarperCollins.

Hayduk, L.A. 1996. *LISREL Issues, Debates, and Strategies.* The Johns Hopkins University Press: Baltimorre and London.

Hayduk, L.A. (1987), *Structural Equation Modeling with LISREL*, The Johns Hopkins University Press: Baltimorre and London.

Hedlund, G. 1994. 'A model of knowledge management and the n-form corporation.' *Strategic Management Journal,* 15: 73-90.

Henriques, I., and Sadorsky, P. 1996. 'The determinants of an environmentally responsive firm: An empirical approach.' *Journal of Environmental Economics and Management*, 30: 381-395.

Henriques, I., and Sadorsky, P. 1999. 'The relationship between environmental commitment and managerial perceptions of stakeholder importance.' *Academy of Management Journal,* 42: 87-99.

Hironaka, A., and Schofer, E. 2002 (forthcoming). 'Loose coupling in the environmental arena: The case of environmental impact assessments," in A.J. Hoffman and M.J. Ventresca (Eds.), *Organizations, Policy and the Natural Environment: Institutional and Strategic Perspectives***,** Stanford University Press.

Hoecklin, L. 1995. *Managing Cultural Differences: Strategies for Competitive Advantage*, Addison-Wesley Publishers, Ltd., AddisonWesley Publishing Co. Inc. and the Economist Intelligence Unit.

Hofstede, G. 1984. *Culture's Consequences: International Differences in Work Related Values*, Beverly Hills, California: Sage Publications.

Hofstede, G. 1991. *Cultures and Organizations: Software of the Mind*, London: McGraw Hill.

Hunt, C.B., and Auster, E.R. 1990, 'Proactive environmental management: Avoiding the toxic trap', *Sloan Management Review,* 31(2): 7-18.

Itami, H. 1987. *Mobilizing Invisible Assets*. Harvard University Press, Cambridge, MA.

Jennings, P.D., and Zandbergen, P. 1995. 'Ecologically sustainable organizations: An institutional approach.' *Academy of Management Review*, 20 (4): 1015-1052.

Kanter, R.M. 1989. *When Giants Learn to Dance: Mastering the Challenges of Strategy, Management, and Careers in the 1990s*. New York: Simon and Schuster.

King, A.A., and Lenox, M.J. 2000. 'Industry self-regulations with sanctions: The chemical industry's Responsible Care Program.' *Academy of Management Journal,* 43(4): 8-716.

King, A.A., and Lenox, M.J. 2001. 'Lean and green? An empirical examination of the relationship between lead production and environmental performance.' *Production and Operations Management*, 10(3): 244-256.

Klassen, R.D., and Whybark, D.C. 1999. 'Environmental management in operations: The selection of environmental technologies.' *Decision Sciences*, 30(3): 601-631.

Knudsen, C. 1996. 'The competence perspective: A historical view', in N.J. Foss and C. Knudsen (Eds.), *Towards a Competence Theory of the Firm*. London, New York: Routledge.

Kogut, B., and Zander, U. 1996. 'What firms do? Coordination, identity, and learning.' *Organization Science*, 7(5): 502-518.

Kogut, B. and Zander, U. 1992. 'Knowledge of the firm, combinative capabilities, and the replication of technology.' *Organization Science,* 3(3): 383-397.

Kotter, J.P., and Heskett, J.L. 1992. *Corporate Culture and Performance*, Free Press.

Leonard-Barton, D. 1992. 'Core capabilities and core-rigidities: A paradox in managing new product development'. *Strategic Management Journal*, 13: 111-126.

Lindman, F.T., Callarman, T.E., Fowler, K.E., and McClatchey, C.A. 2001. 'Strategic consensus and manufacturing performance.' *Journal of Management Issues*, XIII(1): 45-64.

Lippman, S.A., and Rumelt, R.P. 1982. 'Uncertain imitability: An analysis of interfirm differences in efficiency under competition.' *The Bell Journal of Economics,* 13:418-438.

Lyon, T.P., and Maxwell, J.W. 2000. '"Voluntary" approaches to environmental regulation: A survey', in M. Franzini and A. Nicita (Eds.), *Economic Institutions and Environmental Policy*, Aldergate, England.

Miller, D., and Shamsie, J. 1996. 'The resource-based view of the firm in two environments: The Hollywood firm studios from 1936 to 1965.' *Academy of Management Journal,* 39(3): 519-543.

Millistein, M.B., Hart, S.L., and Ilinitch, A.Y. 2002 (forthcoming). 'The differential impact of isomorphic pressures on environmental strategies,' in A.J. Hoffman and M.J. Ventresca (Eds.), *Organizations, Policy and the Natural Environment: Institutional and Strategic Perspectives*, Stanford University Press.

Nadler, D., Tushman, M.L., and Nadler, M.B.1996. *Competing by Design: The Power of Organizational Architecture*. New York : Oxford University Press.

Nanda, A. 1996. 'Resources, capabilities, and competencies', in B. Moingeon and A. Edmondson (Eds.), *Organizational Learning and Competitive Advantage*, Sage Publications.

Nehrt, C. 1998. 'Maintainability of first mover advantages when environmental regulations differ between countries.' *Academy of Management Review*, 23: 77-97.

Nelson, R.R., and Winter, S.G. 1982. *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.

Nonaka, I. 1994. 'A dynamic theory of organizational knowledge creation.' *Organization Science,* 5(1): 14-37.

OECD 1994, *OECD Environmental Performance Review: Japan,* Paris: OECD.

Ouchi, W.G. and Wilkins, A.L. 1985. 'Organizational culture.' *Annual Review of Sociology,* 11: 457-483.

Porter, M.E. and van der Linde, C. 1995. 'Green and competitive: Ending the stalemate.' *Harvard Business Review,* 5: 120-134.

Post, M.E., and Altman, B.W. 1992. 'Models of corporate greening: How corporate social policy and organizational learning inform leading-edge environmental management.' *Markets, Policies and Social Performance,* 13: 3-29.

Priem, R.L., and Butler, J.E. 2001a. 'Is the resource-based "view" a useful perspective for strategic management research?' *Academy of Management Review,* 26(1): 22-40.

Priem, R.L., and Butler, J.E. 2001b. 'Tautology in the resource-based view and the implications of externally determined resource value: Further comments.' *Academy of Management Review,* 26(1): 57-66.

Reed, R., and De Fillippi, R.J. 1990. 'Causal ambiguity, barriers to imitation, and sustainable competitive advantage'. *Academy of Management Review*, 15: 88-102.

Reinhardt, F.L. 1998. 'Environmental product differentiation: Implications for corporate strategy.' *California Management Review*, 40(4): 43-73.

Roht-Arriaza, N. 1997. 'Environmental management systems and environmental protection: Can ISO 14001 be useful within the context of APEC?' *Journal of Environment* and *Development,* 6 (3): 292- 3l6.

Roome, N. 1992. 'Developing environmental management systems.' *Business Strategy and the Environment,* 1: 11-24.

Rothenberg, S., Pil, F.K., and Maxwell, J. 2001. 'Lean, green and the quest for superior environmental performance'. *Production and Operations Management*, 10(3): 228-243.

Rugman, A.M., and Verbeke, A. 1998. 'Corporate strategies and environmental regulations: An organizing framework.' *Strategic Management Journal,* 19: 363-375.

Russo, M., and Fouts, P. 1997. 'A resource-based perspective on corporate environmental performance and profitability.' *Academy of Management Journal,* 40: 534-551.

Sanchez, C.M. 1997. 'Environmental regulation and firm-level innovation: The moderating effects of organizational and individual-level variables.' *Business and Society,* 36 (2): 140-68.

Schein, E.H. 1997. *Organizational Culture and Leadership*, Jossey-Bass Business and Management Series.

Sharfman, M.P., Wolf, G., Chase, R.B., and Tansik, D.A. (1988), 'Antecedents of organizational slack.' *Academy of Management Review*, 13(4): 601-614.

Sharma, S. 2000. 'Managerial interpretations and organizational context as predictors of corporate choice of environmental strategy.' *Academy of Management Journal*, 43: 681-697

Sharma, S., and Vredenburg, H. 1998. 'Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities.' *Strategic Management Journal*, 19: 729-754.

Simonin, B.L. 1997. 'The importance of collaborative know-how: An empirical test of the learning organization.' *Academy of Management Journal*, 40(5): 1150-1175.

Smircich, L. 1983. 'Concepts of culture in organizational analysis.' *Administrative Science Quarterly*, 28: 339-358.

Starik M., and Marcus, A. 2000, 'Special research forum on the management of organizations in the natural environment: A field Emerging from multiple paths, with many challenges ahead', *Academy of Management Journal,* 43: 539-547.

Starik, M., and Rands, G.P. 1995, 'Weaving an integrated web: Multi-level and multi-system perspectives of ecologically sustainable organizations.' *Academy of Management Review*, 20:908-935.

Stead, J.G., and Stead, E. 2000, 'Eco-enterprise strategy: Standing of sustainability', *Journal of Business Ethics,* 24(4): 313-329.

Teece, D.J. 1987. *The Competitive Challenge: Strategies for Industrial Innovation and Renewal.* Cambridge, Massachusetts: Ballinger Publishing Company.

Teece, D.J., Pisano, G., and Shuen, A. 1997. 'Dynamic capabilities and strategic management.' *Strategic Management Journal,* 18(7): 509-533.

Teigland, R., Fey, C.F., and Birkinshaw, J. 2000. 'Knowledge dissemination in global R&D operations: An empirical study of multinationals in high technology electronics industry.' *Management International Review*, 40: 49-77.

Tichy, N. 1982. 'Managing change strategically: The technological, political, and cultural keys.' *Organizational Dynamics*, 11: 59-80.

Trompenaars, F. 1993. *Riding the Waves of Culture*. London: The Economist Books.

Ullman, A.H. 1985. 'Data in search for a theory: A critical examination of the relationships among social performance, social disclosure, and economic performance of US firms.' *Academy of Management Review*, 10(3): 540-557

Van de Ven, A.H., and Poole, M.S. 1995. 'Explaining development and change in organizations.' *The Academy of Management Review*, 20(3): 510-541.

Van de Vijver, F., and Leung, K. 1997. *Methods and Data Analysis for Cross-Cultural Research,* Thousand Oaks, CA: Sage Publishing.

Waddock, S.A., and Graves, S.B. 1997. The corporate social performance-financial performance link. *Strategic Management Journal,* 18: 303-319.

Wernerfelt, B. 1989. 'From critical resources to corporate strategy.' *Journal of General Management,* 14(3): 4-12.

Winn, M. 1995. 'Corporate leadership and politics for the natural environment.' In D. Collins and M. Starik (Eds.), *Sustaining the Natural Environment: Empirical Studies on the Interface between Nature and Organizations.* Greenwich, Connecticut and London, England: JAI Press, Inc.

Winter, S. 1987. 'Knowledge and competence as strategic assets,' in D. Teece (Ed.), *The Competitive Challenge*, Ballinger, Cambridge: MA.

Wood, D.J. 1991. 'Corporate Social Performance Revisited.' *Academy of Management Review,* 16(4): 691-718.

World Bank. 1997. *China 2020*. Washington, DC: World Bank.

Zhang, Vertinsky, I., Ursacki, T., and Nemetz, P. 1999. 'Can China be a clean tiger? Growth strategies and environmental realities.' *Pacific Affairs*, 72(1): 23-37.