Stakeholder Pressures, EMS Implementation, and Green Innovation in MNC Overseas Subsidiaries

ABSTRACT

In this paper, we address the issue of green innovation by the overseas subsidiaries of multinational corporations (MNCs). Drawing upon stakeholder theory and institutional theory, we propose a conceptual model to explain how stakeholder pressures in host countries prompt MNC subsidiaries to undertake green product and process innovations. Our findings indicate that MNC subsidiaries need to meet market stakeholders' pressures in order to achieve social legitimacy in host countries, and that the implementation of formal environmental management systems (EMS) is an important mechanism translating these pressures into green innovation initiatives. Furthermore, we find that the positive relationship between market stakeholder pressures and EMS implementation is reinforced by global 'green' institutional pressures in the different host countries.

Keywords: green innovation; MNC subsidiaries; stakeholder pressures; environmental management systems; global institutional pressures

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INTRODUCTION

It is broadly acknowledged that MNCs must develop locally-designed green strategies in a timely manner to meet enhanced expectations in host country markets (Peng & Lin, 2008; Rugman & Verbeke, 1998; Tatoglu et al., 2014; Yang & Rivers, 2009). MNC leaders are increasingly devoting attention to their subsidiaries' greening initiatives for value creation and opportunity discovery (Watanabe, 2015), whilst also being mindful of the potential adverse effects of subsidiaries' environmental negligence on the reputation and image of the MNC as a whole[1] (Christmann, 2004; Zyglidopoulos, 2002). It has recently been observed that MNC subsidiaries help the local economy transform into a more environmentally sustainable society through their green investments. For example, the Chinese-based division of General Motors expands its involvement in green R&D activities relating to battery manufacturing for hybrid and electric vehicles (Noailly & Ryfisch, 2015). Ford engineers in Europe have been successful in inventing a cutting-edge green technology for the 1.0-litre EcoBoost petrol engine (Ford Sustainability Report 2016/17). To date, researchers anecdotally argue that MNC subsidiaries have become very essential for promoting the diffusion of green technologies to local firms (Li et al., 2018) and greening their regional and global value chain networks (Park et al., 2015). Few studies, however, have considered the issue of green strategies pursued by overseas subsidiaries, and none to our knowledge have focused on subsidiary-driven green innovation.

This paper focuses on the antecedents of green innovation in a sample of US and European subsidiaries of Japanese MNCs. Chen et al (2006: 332) define green innovation "as hardware or software innovation that is related to green products or processes, including the

[1] Two major examples of these adverse reputation effects are Shell's confrontation with Greenpeace over the Brent Spar case in 1995 (Yang & Rivers, 2009), and the BP oil spill disaster in the Gulf of Mexico in 2010 (Freudenburg & Gramling, 2011).

innovation in technologies that are involved in energy-saving, pollution-prevention, waste recycling, green product designs, or corporate environmental management", and categorize green innovation as either green product innovation or green process innovation. Green product innovation represents sustainable innovations in products to enable firms to significantly reduce environmental damage and to achieve higher levels of efficiency in resource allocation over their entire product life cycles (Albino et al., 2009; Chen et al., 2006; Dangelico & Pujari, 2010). Green process innovations are those that constantly develop processes needed to facilitate the efficient use of natural resources and prevent pollution (Chen et al., 2006).

Green product and process innovations may potentially yield a range of benefits to the innovating firm. First, the firm has the opportunity to develop a positive image, differentiate itself from its rivals, and then pursue premium pricing (Hart, 1995; Porter & Van der Linde, 1995). Second, Chang (2011) argues that reinforcing the capacity of a firm to create new environmental products and processes results in improvements in product design and production methods. In a similar vein, Hart (1995) and Frondel et al (2008) suggest that green product and process innovations counterweigh the financial costs involved in overcoming environmental challenges. Third, Porter and Van der Linde (1995: 132) emphasize that pioneering green product and process innovations enables firms to mobilize their strategic and organizational resources more efficiently. They suggest that the early adoption of strict environmental standards may give the firm first-mover advantages, and lead to net benefits. In short, many commentators argue that integrating environmental considerations into corporate strategies may provide a source of sustained competitive advantage (Christmann, 2000).

But there are also costs/obstacles to green innovation. First, green innovations (like all innovations) are costly and the returns are uncertain, so positive net returns are not guaranteed (Walley & Whitehead, 1994). Second, green innovations will still face competition from existing (dirtier) products/processes which may enjoy an installed-base cost advantage at least

in the short-term (Aghion et al, 2009). Third, customers may be reluctant initially to accept the green products, and thus the innovating firms may experience significant additional marketing costs (Aghion et al, 2009). Finally, and most importantly, many of the benefits from green innovation are public, and firms may be reluctant to engage in innovation when they are not able to appropriate fully the resultant benefits.

This consideration of the costs and benefits of green innovation highlights the fact that the social benefits often outweigh the private benefits to the innovating firm, and thus outside stakeholders have incentives to exert pressure on firms to undertake more innovation. Rugman and Verbeke (1998) note that, whilst many MNCs may diffuse environmental practices to their overseas subsidiaries, the subsidiaries must also respond to local pressures exerted by governments, consumers, and other stakeholders to develop local solutions.

The main thesis of this paper is to throw light on the sequential pathways through which these pressures stimulate green innovation within the MNC subsidiaries in a multilevel setting. We argue that foreign subsidiaries with proactive environmental approaches are more sensitive to stakeholder influences than foreign subsidiaries with reactive environmental approaches (Buysse & Verbeke, 2003). The adoption of advanced stakeholder issue identification techniques - such as regular monitoring, complaints screening, and dialogues with special interest groups - will lead to enhanced green innovation performance[2] (Driessen & Hillebrand, 2013). Hence, we hypothesize that the implementation of formal environmental management system (EMS)[3] will facilitate green innovation within MNC subsidiaries. EMS may be viewed as a standardized process of cross-functional transfer of knowledge about how to reduce

[2] Following Chen et al (2006: 333) we define green innovation performance as "the performance of hardware and software involved in the innovation that a company carries out in relations to green products or processes, including the innovation in technologies that are involved in energy saving, pollution-prevention, waste recycling, green product designs, or corporate environmental management."

[3] An EMS is composed of a bundle of internally-consistent environmental routines that enhance corporate environmental performance, including, for example, (1) environmental action plans with quantified target requirements, (2) written environmental documents, (3) full environmental cost accounting, (4) standardized environmental auditing and monitoring, and (5) environmental risk evaluations (Berry & Rondinelli, 1998; Henriques & Sadorsky, 1996, 1999; Darnall et al., 2008, 2010).

environmental burdens (Florida & Davion, 2001) but also, independent of economic objectives, essential for getting ahead of changing environmental requirements (Morrow & Rondinelli, 2002) and obtaining greater social legitimacy (Berrone et al., 2013; Suchman, 1995). Such strategically-proactive firms that monitor stakeholder demands are more likely to devote their attention, capital, and time to formalizing and structuring their environmental practices, which will, in turn, create incentives for product and process innovations (Bocquet et al., 2013). In short, we hypothesise that green innovation within MNC subsidiaries is stimulated by a range of local stakeholder pressures (regulatory, market and societal) but that these pressures are mediated by the implementation of local EMS initiatives. Furthermore, we argue that the impacts of these stakeholder pressures on EMS implementation are amplified in national institutional contexts which support global environmental norms.

This paper makes several contributions to the literature. First and foremost, we contribute to prior studies testing how stakeholder pressures affect green innovation (Berrone et al., 2013; Dangelico & Pujari, 2010). We hypothesise that EMS implementation is a mechanism by which MNC subsidiaries' respond to stakeholder pressures, and which in turn prompts them to introduce green product and green process innovations. This is the first study to disentangle the complexities of the relationships between stakeholder influences and green innovation by suggesting EMS implementation as a key mediator in such relationships. Second, we focus on the MNC subsidiary as an entity which responds to local stakeholder pressures, and which does not just take directions from its parent company. Focusing on the MNC subsidiary as a unit of analysis leads us to distinguish how green innovative capabilities vary according to individual units within the MNC network. Furthermore, the MNC subsidiaries in our empirical analysis are located in twenty-three different host countries, and are thus subject to different national institutional contexts with regard to global pro-environmental pressures. Our multilevel framework highlights both global institutional arrangements and local

stakeholder demands, and thus allows us to consider different configurations of stakeholder pressures and institutional influences (Lee, 2011; Martínez et al., 2016). Our framework throws light on the complexities inherent in the development of green innovation initiatives and helps subsidiary managers to align their environmental strategies with both global and local stakeholder influences at the same time. Third, we consider green process innovation and green product innovation as separate constructs, whereas most of the extant literature treats green innovation as a unitary concept.[4]

The paper is structured as follows. In the next section, we review the empirical literatures on the determinants of green innovation and on corporate environmental initiatives in MNC subsidiaries. Drawing upon institutional theory and stakeholder theory, we then develop various hypotheses related to EMS implementation and green innovation in MNC subsidiaries. Our empirical analysis is based upon primary data obtained from a questionnaire survey of Japanese MNC subsidiaries, and the following section contains information about the administration of the survey, the measurement of key variables, and the estimation methodology. We then present and discuss the empirical results. The final section discusses the implications of our findings, and suggests avenues for future work.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

There is a sizeable empirical literature on the determinants of green innovation, though much of it focuses on domestic firms in single-country settings - see Egri and Ralston (2008) and Holtbrügge and Dögl (2012) for excellent reviews. The empirical literature on the relationship between stakeholder pressures and green innovation shows mixed results. Berrone et al (2013) found that institutional pressures from regulatory bodies and normative actors were

[4] We distinguish between green product innovation and green process innovation for two reasons. First, the use of a unitary measure of green innovation might mask the differences in terms of the interplay of EMS implementation and the green product and process innovations. Second, green product and green process innovations are largely different in technical aspects and criteria, and types of practices (Abdullah et al., 2016; Cuerva et al., 2014).

a crucial determinant of green innovation in US firms. Similarly, Frondel et al (2008) showed that regulatory stakeholder pressures bolstered green innovation and abatement activities. In contrast, Lin et al (2014) observed that stakeholder pressures from customers had a negative impact on green process innovation. According to Lin (2014), one plausible explanation for why market pressures are negatively related to green process innovation can simply involve firms' limited information accessibility from consumers – that is, since firms' commitment to green process innovation is less clear in the eyes of consumers as compared to green product innovation. They may thus be reluctant to engage in green process innovation projects whilst they experience increased expenditure on investment in green product innovation. Other studies were inconclusive. Jaffe & Palmer (1997) reported that regulatory stakeholder pressures had no bearing upon environmental innovation. Wagner (2007) reported that three separate groups of environmentally-concerned stakeholders had no discernible impact on green process and product innovations. And Wagner (2009) found no link between regulation and the creation of environmentally-beneficial product and process innovations.

There are, however, only several studies where MNC subsidiaries are the unit of analysis, and which focus on corporate environmental initiatives – see Table 1[5]. Peng and Lin (2008) highlighted the effects of local stakeholder pressures on green management adoption in the Chinese subsidiaries of Taiwanese firms. Muller (2006) observed that the Mexican subsidiaries of four European MNCs (Scania, Volvo, Mercedes, and Volkswagen) had the freedom to develop and execute proactive environmental strategies aligned with the local institutional contexts. Aguilera-Caracuel et al (2012) consider the drivers of environmental standardization within MNCs, and report that standardization is greater the lower the

[5] In constructing Table 1, we performed an interdisciplinary literature review focusing on published articles in the selected areas of "international business", "management", "corporate social responsibility", and/or "innovation". More specifically, we searched and identified articles containing the key terms "MNC subsidiaries" or "foreign affiliates", and "proactive environmental practices" or "environmental initiatives" or "environmental sustainability" or "environmental protection" or "environmental performance" or "environmental innovation capabilities" or "green innovation".

environmental institutional distance between the MNC home country and the host countries of the subsidiaries. Choi and Park (2014) look at the antecedents of environmentally responsible management in MNC subsidiaries, and report that local governments, NGOs and the media all exert influence along with the parent companies. Tatoglu et al (2014) considered the adoption of voluntary environmental practices by MNC subsidiaries in Turkey, and confirmed the influence of local stakeholder pressures. In addition, Yang and Rivers (2009) advanced various propositions about the adoption of corporate social and environmental initiatives in overseas subsidiaries, but did not provide any empirical analysis. However, none of these extant studies considered mechanisms through stakeholder pressures influence green innovation and how the effect of stakeholder pressures on EMS implementation varies according to country-level institutional arrangements.

***** Table 1 about here *****

This study thus fills a gap in the literature by focusing on the determinants of green innovation in MNC subsidiaries across a variety of host countries, and in highlighting the mediating role of EMS implementation. Our theoretical model of green innovation draws upon institutional theory and stakeholder theory. Institutional theory posits that firms' actions are influenced not just by their corporate objectives and competitive pressures, but also by their institutional/social environments – such environments embrace both formal rules and laws set by governments and other regulatory authorities (North, 1990) and informal constraints (norms of behavior, shared values, beliefs) supported by society at large (Di Maggio & Powell, 1983). Firms are obliged to conform to these rules and constraints in order to obtain acceptance from local society – failure to do may jeopardize the success of the firm (Scott, 1995). In particular, MNC subsidiaries need to understand and adapt to their foreign institutional environments in environmentally responsible ways if they are to achieve social acceptance and legitimacy (Suchman, 1995) and to overcome the liability of foreignness (Campbell et al., 2012; Kostova

& Zaheer, 1999; Kostova et al, 2008). Building on Suchman's (1995) view on organizational legitimacy[6], environmentally-responsible strategic choices are crucial for MNC subsidiaries in developing their social legitimacy in the eyes of local stakeholders. If MNC subsidiaries fail to conform to local socially-accepted norms regarding environmental protection, they will find it difficult to achieve stability because of limited access to scarce resources and/or negative CSR reputations (Child & Tsai, 2005; Suchman, 1995). Thus, in the context of this paper, MNC subsidiaries need to recognize the importance of meeting local stakeholders' expectations (Zhao et al, 2014) in order to achieve financial success.

Stakeholder theory asserts that maintaining trust-based cooperation with a broad set of stakeholders is an inevitable part of organizational decision-making with respect to corporate strategy, corporate governance, and social and environmental management (Freeman, 1984; Hart, 1995). A stakeholder refers to "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984, p. 46). Following Delmas and Toffel (2004), Darnell et al (2008, 2010) identify the various stakeholder groups who are most likely to exert pressure on firms and thus influence their environmental practices, notably regulatory, market, and social actors. Darnall et al (2008: 366-7) suggest that regulatory pressures involve legal mandates for firms to attend to environmental issues and to implement proactive environmental policies. Market pressures arise as industrial customers, household consumers and suppliers become increasingly aware of the natural environment, and exercise their power to encourage firms to adopt environmentally-friendly practices and/or eschew polluting activities. Social actors include environmental organizations, community groups, trade associations, and labor unions. These actors are able to mobilize public opinion, and thus instigate societal pressures on firms to reduce the adverse impact of their activities upon the

[6] Suchman (1995: 574) defines legitimacy as follows: "Legitimacy is socially constructed in that it reflects a congruence between the behaviors of the legitimated entity and the shared (or assumedly shared) beliefs of some social group; thus, legitimacy is dependent on a collective audience, yet independent of particular observers."

natural environment. In practice, MNC managers may need to balance heterogeneous and conflicting stakeholder interests.

Regulatory Stakeholder Pressures & EMS Implementation

The stakeholder management literature proposes that regulatory authorities (such as governments, politicians and legislatures) enforce laws and rules that minimize the effect of negative externalities resulting from environmental pollution on the co-evolution of business organizations, markets, and society (Henriques & Sadorsky, 1996). Stakeholder pressures from regulatory authorities are considered to enhance environmental performance (Campbell, 2006; Eiadat et al, 2008) and self-regulation of environmental compliance (Christmann & Taylor, 2006) as environmental regulations appear as a crucial factor for developing proprietary pollution prevention capabilities. Furthermore, Berrone et al (2013) and Menguc et al (2010) note that firms formulate and implement environmental management policies to improve their social legitimacy and acceptance in the eyes of public authorities.

There are several reasons to expect a positive association between regulatory stakeholder pressure and the incentive of MNC subsidiaries to implement EMS. First and foremost, regulatory stakeholders may have the power to impose sanctions, legal penalties, taxation, and litigation costs on firms violating regulatory requirements regarding environmental protection (Darnall, 2008, 2010). Second, Sharma et al. (2007) note that changing regulatory demands associated with environmental sustainability increase both the complexity and the uncertainty of firms' business environments and thus prompt managers to constantly cultivate new resources and innovative strategies in a timelier fashion. Berry and Rondinelli (1998) argue that the cost of devising, developing, and executing proactive environmental strategies that meet environmental protection expectations in a self-fulfilling manner is considerably lower than with the cost involved in overcoming the complexity of regulatory demands by public authorities. Third, McWilliams and Siegel (2001) argue that

various regulatory bodies have the ability to reward firms with proven environmental awareness by stimulating demand through consumption of environmentally-friendly products. Fourth, Porter and Van der Linde (1995) suggest that strict environmental regulations may improve firms' resource productivity by prompting them to engage in the continuous development of new green competencies. Furthermore, firms with specific green technologies will tend to lobby for higher regulatory standards to raise the costs and block the entry of rivals who do not possess similar resources and capabilities (Puller, 2006). We thus put forward the following hypothesis:

Hypothesis 1: *Regulatory stakeholder pressures are positively associated with EMS implementation in MNC subsidiaries*

Market Stakeholder Pressures & EMS Implementation

The growth of market stakeholders who are environmentally conscientious stems from the enhanced availability of environmental information (Darnall et al, 2008). Further, with increased environmental awareness, customers have been exerting increasing pressure on companies to undertake a series of environmentally responsible actions (Buysse & Verbeke, 2003; Christmann, 2004). It is widely recognized that such customer requirements act as forces coercing firms to adopt appropriate environmental behavior (Delmas & Toffel, 2004). Furthermore, industrial clients and commercial buyers are key agents in terms of the diffusion of environmental management practices (Delmas & Toffel, 2004) and close cooperation with these market actors further facilitates organizational imitation on environmental issues (Lie et al, 2010).

There are four main reasons to expect a positive association between market stakeholder pressures and EMS implementation. First, the environmental management literature highlights that customers are very likely to reward firms' environmental proactivity by renewing their selling agreements and "buy-cotting" green products and services (Darnall et al, 2010). In

contrast, when firms use polluting technologies and fail to reduce physical waste, they may be subjected to high levels of public boycotts directly resulting in decreased sales volume and competitiveness (Henriques & Sadorsky, 1999). Second, customers may even go further and punish polluting firms through initiating legal actions (Menguc et al, 2010: 9). Third, industrial customers often exploit their resource interdependencies to exert direct influence over firms' resource allocation decisions (Frooman, 1999). Fourth, corporate reputations are important intangible resources, and so firms must ensure that they meet the expectations and claims of market stakeholders (Branco & Rodrigues, 2006) to increase moral capital (Kane, 2001). We thus put forward the following hypothesis:

Hypothesis 2: *Market stakeholder pressures are positively associated with EMS implementation in MNC subsidiaries*

Societal Stakeholder Pressures & EMS Implementation

Social actors such as environmental organizations, community groups, trade associations and labour unions play important roles in monitoring the ways in which firms implement and promote environmental policies. Henriques and Sadorsky (1999) stress the rising coercive power of such social actors as a major source of pressure on the environmental conduct of firms, whilst Delmas and Toffel (2004) point out that the need to promote good corporate citizenship and dedicated community relations fosters firms' decisions to implement environmental sustainable practices.

There are several reasons to expect a positive association between societal stakeholder pressures and EMS implementation. First, environmental-concerned NGOs act as catalysts for shaping and introducing codes of conduct and international environmental standards (Doh & Guay, 2004). Second, such NGOs affect the public awareness of environmental issues through the dissemination of green information (Hoffman, 2000) and the establishment of stakeholder forums that inspire participants to notice the importance of environmental sustainability

(Sharma et al., 2007). Third, NGOs may also directly punish firms with polluting activities by filing lawsuits (Henriques & Sadorsky, 1996) or by mobilizing people to participate in protest campaigns (Darnall et al, 2008). Fourth, social groups may directly influence patterns of resource flows toward firms, particularly when firms' environmental actions are detrimental to public welfare (Kassinis & Vafeas, 2006). In short, firms are obliged to implement environmental management policies to improve their social legitimacy (Berrone et al, 2013; Suchman, 1995) and minimize their liabilities of foreignness (Campbell et al., 2012).

These societal pressures will be all the stronger for MNC subsidiaries. MNC subsidiaries must meet higher environmental management standards than their local counterparts as their visibility frequently tends to capture the attention of the media and social groups (Peng & Lin, 2008; Tatoglu et al, 2014). Furthermore, corporate involvement in environmental protection at the subsidiary level may affect not only the subsidiary involved but the entire MNC; an MNC's environmental negligence in one country may be detrimental to the reputation and image of the MNC as a whole as well as of subsidiaries in other countries (Christmann, 2004). We thus put forward the following hypothesis:

Hypothesis 3: *Societal stakeholder pressures are positively associated with EMS implementation in MNC subsidiaries*

Institutional Influences, Stakeholder Pressures & EMS Implementation

How does the intensity of these stakeholder pressures vary according to host countries' participation in global environmental frameworks? We theorize that global institutional pressure positively moderates the impact of stakeholder pressures on MNC subsidiaries to adopt EMS. Institutional theory is traditionally of significant relevance for the international business, stakeholder, and environmental management literatures. An institutional perspective posits that both individuals and organizations are exposed to accommodate a variety of coercive,

normative, and cognitive pressures from institutional environments in order to gain local legitimacy (Scott, 1995; Suchman, 1995).

Scholars argue that global discourses and internationally institutionalized culture directly influence the complex relationship between local stakeholders and MNC subsidiary environmental strategies (Doh & Guay, 2006; Frank et al., 2000; Hartmann & Uhlenbruck, 2015; Rugman & Verbeke, 1998). The establishment of global CSR agendas and charters not only facilitates the global diffusion of norms to enhance environmental standards but also encourages local actors at all levels of civil society to comply with global environmental values (Lim & Tsutsui, 2012). The penetration of strongly 'taken-for-granted' models of global pro-environmentalism effectively legitimates local consumers and NGOs to exert pressure on governments' green policy-making through social movements (Campbell, 2006; Frank et al., 2000; Schofer & Hironaka, 2005). Scholars argue that binding environmental treaties in particular provide the catalyst for promoting corporate greening (Schofer & Hironaka, 2005) and play a critical role in coordinating and harmonizing national environmental laws and regulations (Hartmann & Uhlenbruck, 2015). Moreover, government ratifications of international environmental treaties help empower NGOs to develop international environmental standards and thus act as a primary source of global institutional pressure.

However, there is a serious lack of research on the complementary effect of global institutional pressure on the relationship between diverse stakeholder pressures and EMS implementation at the MNC subsidiary level. Whilst the configuration of international institutional arrangements and stakeholder power is anecdotally said to drive companies' environmental decision-making, no researchers have empirically tested such cross-level interactions to our best knowledge. In the environmental management literature, existing studies have regarded institutions and stakeholders as separate external pressures that transform the stance of corporations toward responsible environmental behaviour (Lee, 2011). However,

Martínez et al. (2016) suggest that institutional and stakeholder pressures would act as complementary constraints to force firms to operate in environmentally-responsible ways.

Institutional pressures from global civil society potentially affects not only the legitimacy and relevance of stakeholders and but also MNC managers' perceptions of environmental values (Hartmann & Uhlenbruck, 2015). The reactive or proactive nature of corporate involvement in social and environmental initiatives depends significantly on the extent to which stakeholders are influenced by global institutions. Specifically, global institutional pressure also serves as an incentive for corporate management to initiate or participate in institutionalized dialogues with a variety of local stakeholders in a cooperative manner. Given the rising power of global civil society, the effective stakeholder communication that promotes environmental governance and accountability hence prevents corporations from adopting unethical and environmentally irresponsible practices (Child & Tsai, 2005). Lee (2011: 285) notes that "institutional support and legitimacy enables even traditionally marginal and resource-deficient stakeholders to exert significant influence on powerful organizations by shaping the conditions under which interactions between firms and stakeholders take place". Although we acknowledge that our hypotheses remain exploratory in nature, this study is the first study to empirically investigate the moderation effect of global institutional pressure on the positive relationship between stakeholder demands and MNC subsidiaries' proactive attitude toward environmental management. By integrating the micro- and macro-level perspectives, we would expect that global institutional pressure will amplify the impact of stakeholder pressures on the MNC subsidiaries' environmental initiatives, hence we hypothesize:

> ***Hypothesis 4a:*** *Global institutional pressures moderate the relationship between regulatory stakeholder pressures and EMS implementation.*

Hypothesis 4b: *Global institutional pressures moderate the relationship between market stakeholder pressures and EMS implementation.*

Hypothesis 4c: *Global institutional pressures moderate the relationship between societal stakeholder pressures and EMS implementation.*

EMS Implementation & Green Innovation

In this section, we develop two hypotheses linking EMS implementation by MNC subsidiaries directly to green product and green process innovation. Many scholars have argued that EMS implementation fosters a firm's organizational capabilities such as continuous innovation, stakeholder integration and high-order learning (Demirel & Kesidou, 2011; Kesidou & Demirel, 2012). When firms design and develop corporate environmental policies, they are more likely to strive to get ahead of minimum requirements through proactively improving technological innovations with high environmental benefits such as end-of-pipeline pollution control technologies and integrated cleaner production technologies (Demirel & Kesidou, 2011). Furthermore, the systemic nature of EMS implementation is likely to assist organizations in consistently instructing employees to run operations in line with environmental requirements (Vidal-Salazar et al, 2012). Florida and Davison (2001), suggest that firms with high EMS adoption are innovative as they implement advanced quality management programs, foster environmental information sharing, and attach importance to reducing community environmental risk. Moreover, proactivity in environmental management leads firms to identify potential sources of pollutant emissions and chemical spills, and, in turn, respond to negative environmental effects more innovatively. Considered together, we thus propose the following hypotheses:

Hypothesis 5a: *EMS implementation is positively associated with green product innovation in MNC subsidiaries*

Hypothesis 5b: *EMS implementation is positively associated with green process innovation in MNC subsidiaries*

Our theoretical model is as shown in Figure 1.

***** Figure 1 about here *****

DATA AND METHODOLOGY

The dataset used for the empirical analyses was constructed from the responses obtained from 123 North American and European subsidiaries of Japanese manufacturing MNCs. We focus on manufacturing subsidiaries as manufacturing activities typically generate more contaminants than other (e.g., service) activities (Stites & Michael, 2011), and hence such subsidiaries should be more sensitive to stakeholder pressures. We have also limited the sample to MNCs from one home country (Japan) to avoid potential country-of-origin effects, and effects due to variations in cultural/institutional distances between home and host countries, that might impact upon subsidiary decision-making. The choice of Japanese MNCs was motivated in part by data availability, but also because Japanese MNCs are noted for their greater attention to environmentally-benign manufacturing, energy conservation and post-industrial recycling than their US and European counterparts (Gutowski et al, 2005).

In this section, we first detail how the questionnaire survey was administered. We then explain how the constructed variables and the control variables were measured, and also outline the measures taken to avoid common method bias. The estimation methodology is then briefly discussed, and the section concludes with some descriptive and diagnostic statistics.

Administration of the Questionnaire Survey

The questionnaire was designed following a careful review of the extant literature in international business and environmental management. English and Japanese versions of the questionnaire were prepared by the first author. The English-based survey was translated by a professional translation company into Japanese. Two native speakers with fluency in both

Japanese and English then proof-read the Japanese version of the questionnaire and back-translated it into English (Dawson & Dickinson, 1988). No significant differences were observed in terms of the accuracy of the back-translated sentences. Before mailing the survey to the respondents, three Japanese subsidiary managers were contacted in April 2013 and requested to verify the validity and clarity of a draft version.

A random sample of 1000 Japanese MNC subsidiaries in North America and Europe was identified from the 2013 version of *The Tôyô Keizai Kaigai Shinshutsu Kigyô Sôran* (Toyo Keizai, 2013), and the same publication was also used as the source for the names of subsidiary directors. Our self-report survey is suitable for environmental management at the subsidiary level, even if there remains potential for social desirability distortion that may inflate relationships. The primary reason is that subsidiary directors are usually familiar with subsidiary-level environmental performance measures since they have to make strategic environmental decisions in response to environmentally concerned stakeholders across varying institutional environments on a daily basis (Tatoglu et al., 2014). Furthermore, the lack of subsidiary-level data sources on environmental management also validates the reason to use self-reported variables. Questionnaires were mailed to these 1000 directors in mid-May 2013, but 20 were undeliverable. Non-respondents were reminded by e-mail or telephone one month after the mailing. 123 questionnaires were received, equivalent to an effective response rate of 12.6%. This response rate was similar to those obtained in comparable studies (e.g., Ben Brik et al., 2011: 13%; De Giovanni & Esposito Vinzi, 2012: 10%), and in line with typical response rates (6% - 16%) in international mail surveys (Harzing, 1997). Bansal and Roth (2000) have also commented on the difficulties of obtaining data from Japanese firms regarding managerial perceptions of corporate environmental responsiveness[7].

[7] One of the difficulties of obtaining data on environmental practices from Japanese MNCs is that they are often sensitive about data protection. This sensitivity is enhanced if the request for data comes from non-Japanese scholars, especially as the vast majority of subsidiary managers are Japanese nationals in line with the traditional ethnocentric staffing policies of Japanese MNCs. As one of the co-authors was Japanese, we were able to reduce

Comparisons of early and late respondents with regard to subsidiary size and subsidiary age were made to check for non-response bias (Armstrong & Overton, 1977), but t-tests revealed no statistically significant differences. Non-response bias was thus not deemed a serious issue. Some questions were unanswered on nine of the 123 questionnaires owing to very sensitive topics or a lack of time (Schafer & Olsen, 1998). As the sample size was not large, we decided not to delete these cases but instead to use expectation maximization (EM) algorithm to impute missing values (Roth, 1994).[8] Compared to other alternative methods such as pairwise deletion, mean substitution, and non-stochastic imputation (Schaffer & Graham, 2002), the expectation maximization (EM) technique is more appropriate in handling the issue of missing values (Fichman & Cummings, 2003; Little & Rubin, 1987; Schaffer & Graham, 2002). It yields unbiased, efficient, and consistent parameter estimates if the data are random (Fichman & Cummings, 2003). As highlighted by statistics scholars, the EM method helps mitigate inaccurate standard errors, thus attaining a greater predictive power (Hair et al., 1998). Additionally, the strength of this statistical procedure is to compute the optimal parameter estimates by performing an expectation step and a maximization step iteratively until convergence occurs in the estimates of the missing values (Meyers et al, 2016; Roth, 1994). The percentage of missing scores in this study was approximately 1% of the complete dataset. We used the EM algorithm in IBM SPSS Statistics 23.

The Constructed Variables

Three groups of questions related to stakeholder pressures were included in the questionnaire – see the Appendix. *Regulatory stakeholder pressures* were assessed by asking the respondents to answer the question used by Darnall et al (2010) regarding the importance

this sensitivity by being able to conduct (personal and telephone) interviews in Japanese and to prepare the survey instruments in Japanese.

[8] The use of the EM method is widely used by IB scholars (Harzing & Noorderhaven, 2006; Noorderhaven & Harzing, 2009).

of local governments on the process of designing, developing, and executing subsidiary environmental policies. A 3-point Likert scale, ranging from 1 ("not important") to 3 ("very important") was used for measurement. The average was 2.53 (s.d. = 0.56). *Market stakeholder pressures* were measured by asking the respondents to answer the question used in the study of Darnall et al (2010) regarding the importance of (1) household consumers, (2) commercial buyers, and (3) suppliers of goods and services on the process of designing, developing, and executing subsidiary environmental policies. A 3-point Likert scale (1 = "not important" and 3 = "very important") was used for measurement. The average was 2.41 (s.d. = 0.48). *Societal stakeholder pressures* were measured by asking the respondents to answer the questions used by Darnall et al (2010) regarding the importance of (1) environmental groups, (2) community organizations, (3) labour unions, and (4) trade or industry associations on the process of designing, developing, and executing subsidiary environmental policies. A 3-point Likert scale (1 = "not important" and 3 = "very important") was used for measurement. The average was 1.99 (s.d. = 0.45).

Subsidiary-level data on the implementation of environment management systems are not publicly available (Delmas & Toffel, 2004), hence this outcome was assessed in the survey by a set of six statements – see the Appendix – based on Du et al (2012). A 5-point Likert scale, ranging from 1 ("completely disagree") to 5 ("completely agree") was used for measurement. The average was 3.40 (s.d. = 0.80).

Finally, there were two groups of questions related to green innovation – see the Appendix. Past research has relied largely on the use of a single indicator to assess the level of green innovation strategies (e.g., Dangelico & Pujari, 2010; Eiadat et al, 2008), but here we distinguish between green product innovation and green process innovation. Drawing on the survey by Chen et al (2006), *green product innovation* was measured by asking the respondents to assess their perceptions of an environmental strategy using a five-point Likert scale ranging

from 1 (“completely disagree”) to 5 (“completely agree”). The average score was 3.70 (s.d. = 0.82). Also based upon Chen et al (2006), *green process innovation* was measured by asking the respondents to assess the extent to which they agreed with four statements, based on a five-point Likert-type scale ranging from 1 (“completely disagree”) to 5 (“completely agree”). The average was 3.75 (s.d. = 0.72).

Common Method Variance

The questionnaire items were based upon perceptual evaluations, so it is necessary to consider common method variance. We minimized *ex ante* the possibility of common method bias in several ways. First, we guaranteed the confidentiality and anonymity of all data in a personalized cover letter to each respondent so as to reduce social desirability bias (Chang et al, 2010). Second, as proposed by Chang et al (2010), the order of the questions was randomized so that the respondents could not perceive the detailed content of each construct. Third, following Podsakoff et al. (2003), we carefully trimmed our questionnaire items to promote clarity and increase respondents’ comprehension. In addition, we adopted the marker variable technique as a *post hoc* statistical remedy (Lindell & Whitney, 2001). We included employee performance as a theoretically-unrelated marker variable in our model: none of the statistically significant partial correlations between the constructs lost significance after the adjustment, hence common method bias was not a serious issue. We also checked *ex post* for common method bias by Harman’s (1967) single factor test (Podsakoff et al, 2003). All the items underpinning the independent and dependent variables were loaded on a one-factor model: the proportion of the variance explained by the first factor did not exceed 50% indicating again that common method variance was not a major issue.

The Moderating Variable

Similar to the previous scholarship (Hartmann & Uhlrenbruck, 2015), we proxied the strength of global institutional pressure by using information on the depth of a country’s active

participation, contribution to, and compliance with international environmental agreements by the Yale Center for Environmental Law and Policy (Esty, 2005). The score ranges between 0 (no participation) and 1 (full participation). The average was 0.85 (s.d. = 0.13).

The Control Variables

Three additional control variables were included in the model. First, we included the size of the MNC subsidiary, measured by the natural logarithm of the total number of local employees. From the resource-based perspective, subsidiary size can be taken as a proxy for resource availability and indicates the extent to which subsidiaries have the ability to implement comprehensive environmental policies (Aragón-Correa, 1998). Our second control variable is the age of the MNC subsidiary, and we expect older subsidiaries to be more responsive to local environmental pressures than more recently-established subsidiaries. The third control variable is the subsidiary's innovation capabilities. Existing research provides evidence that innovation capabilities are related positively to proactive environmental strategy (Sharma et al, 2007) and eco-innovations (Berrone et al, 2013). We used Wang and Bansal's (2012) four-item 5-point Likert scale – see the Appendix - to measure innovation capabilities ($\alpha = 0.84$). We also included three parent company attributes (parent size, parent age, and parent CSR performance) as control variables. Both MNC parent size and MNC parent age were measured by the natural logarithm transformation of the number of employees and the years since the company was founded respectively. MNC parent CSR performance was measured by a dichotomous variable that takes a value of 1 if a given parent company was ranked in the Tôyô Keizai's CSR Ranking Top 100 (2013) and a value of 0 otherwise.

Estimation Methodology

The hypotheses were tested using partial least squares (PLS) regression[9], a variance-based approach more suitable for structural measurement models than covariance-based

[9] See Ciabuschi et al (2014) and Fey et al (2009) for other examples of the use of PLS regression in IB research.

structural equation modelling (SEM) methods (Hair et al., 2011). The use of PLS regression is advantageous for three reasons: First, PLS regression does not require the application of restrictive assumptions in terms of sample size and multivariate normality distribution (Wold, 1982). Second, PLS regression yields more accurate and rigorous parameter estimates, particularly when models are complex because of the inclusion of many measurement items per variable (Hair et al, 2011; Hair et al, 2012). Third, PLS regression enables simultaneous assessment of statistical significance when multiple dependent variables exist in the model. All the PLS regression analyses were performed using SmartPLS 3.0 software (Hair et al., 2016).

Descriptive & Diagnostic Statistics

The 123 subsidiaries in the sample operated in 23 host countries: the most popular countries were the United States (21), the Czech Republic (18), the United Kingdom (17), Germany (10), Hungary (7) and Poland (7) – see Table 2. The means and partial correlation coefficients are shown in Table 3. The subsidiaries were generally large firms (673.7 employees on average) with long histories of business operations in their host economies (21.64 years on average). The subsidiaries have been active in green innovation, with mean values of 3.70 and 3.75 for product and process innovation respectively. The scores for global institutional pressure in the 23 host countries are also shown in Table 2. These scores show considerable national variations, ranging from 0.35 for Montenegro to 1.0 for the United Kingdom. By way of comparison, the score for Japan was 0.85. The variance inflation factor (VIF) values for the explanatory variables were all lower than ten, confirming that multicollinearity was not likely to be a problem (Myers, 1990).

***** Tables 2 & 3 about here *****

The Cronbach alpha values for the six constructed variables all exceeded the minimum 0.60 criterion (Morrison, 1976; Nunnally, 1978), and were deemed acceptable. The composite

reliability values of all the constructs were higher than the threshold of 0.70, confirming internal reliability. As shown in Table 4, the average variance extracted (AVE) values were all well-above the cut-off value of 0.50 (Fornell & Larcker, 1981), so the convergent validity of each of the six constructs was satisfactory. The standardized factor loadings from the PLS analysis were all above the 0.50 threshold (Falk & Miller, 1992), also suggesting convergent validity for all constructs.

***** Table 4 about here *****

EMPIRICAL RESULTS

We first conducted confirmatory factor analyses using LISREL 9.1 to assess the overall model fit (Jöreskog & Sörbom, 2012). The maximum likelihood ratio chi-square for the model was statistically significant (χ^2=287.973, p-value < 0.01). Other goodness-of-fit statistics also met the acceptable values suggested by MacCallum et al (1996) and Hu and Bentler (1999): the comparative fit index [CFI] = 0.958; the incremental fit index [IFI] = 0.959; the root mean square error of approximation [RMSEA] = 0.0628; and the non-normed fit index [NNFI] = 0.950. These indices confirm that the model is consistent with the data. For the standardized root mean square residual (SRMR) as a model fit measure in PLS, the value in our study (0.077) was below a value of 0.08 indicating an appropriate level of fit (Hu & Bentler, 1998). R^2 values are also calculated to assess the goodness-of-fit of the three sets of relationships within the model (Hulland, 1999) – see Table 4. The value of R^2 for the link between stakeholder pressures and EMS implementation was 0.149; the value of R^2 for the link between EMS implementation and green product innovation was 0.433; and the value of R^2 for the link between EMS implementation and green process innovation was 0.484. The average R^2 was 0.355, suggesting that our path model was acceptable (Chin, 1998), and that the explanatory variables account for a large percentage of the variance in the dependent variables.

Figure 2 shows the path coefficients estimated from the PLS regression model using a bootstrapping method. All path coefficients can be interpreted in the same way as β-statistics from Ordinary Least Squares (OLS) regression. All the standardized coefficients have the expected positive signs although, probably because the sample size (n = 123) is fairly small, not all are statistically significant. Thus, market stakeholder pressures have a significant ($\beta = 0.183$, $p < 0.05$) effect on EMS implementation, whereas the effects of both regulatory stakeholder pressures ($\beta = 0.075$, n.s.) and societal stakeholder pressures ($\beta = 0.093$, n.s.) are insignificant albeit positive. Hypothesis H2 is thus supported, whilst H1 and H3 do not receive empirical support. As expected, these positive influences are all amplified by pressure from global environmental regime, but the effect is only significant in the case of market stakeholder pressures ($\beta = 0.127$, $p < 0.05$). Hypothesis 4b is thus supported. As regards the control variables, green product innovation is positively and significantly related to subsidiary size ($\beta = 0.161$, $p < 0.1$), subsidiary age ($\beta = - 0.133$, $p < 0.1$.), subsidiary innovation capabilities ($\beta = 0.238$, $p < 0.01$), MNC parent size ($\beta = - 0.178$, $p < 0.1$), and MNC parent CSR performance ($\beta = 0.145$, $p < 0.1$). In short, it appears that market pressures exerted by customers and suppliers are the most important influence upon MNC subsidiaries' implementation of proactive environmental policies, and that this influence is amplified in host countries with high global institutional pressures. Furthermore, EMS implementation is more likely to be embraced by larger subsidiaries with more innovation capabilities. Following Aiken and West (1991) and Cohen et al. (2003), we plotted the relationship between market stakeholder pressures and EMS implementation for different levels of participation in global environmental frameworks– see Figure 3. In countries with weak (one standard deviation below the average) penetration of global pro-environmentalism, market stakeholder pressures exert a positive but relatively weak effect upon EMS implementation. In contrast, the effect of market stakeholder pressures on EMS implementation is much more pronounced in countries with strong (one

standard deviation above the average) penetration of global pro-environmentalism. This finding lends support to the claim by Lee (2011) that it is necessary to consider the combination of national institutional pressures and local stakeholder pressures.

***** Figures 2 & 3 3 about here *****

EMS implementation is in turn positively associated with both green product innovation ($\beta = 0.429$, $p < 0.01$) and green process innovation ($\beta = 0.615$, $p < 0.01$). Hypotheses 5a and 5b are thus strongly supported. Using Hayes' (2013) PROCESS macro, we performed bootstrap analyses (Bootstrap sample size = 5000) to verify whether our mediated model provides better explanatory power than an alternative model that envisages the stakeholder pressures having direct impacts on both environmental product and process innovations within MNC subsidiaries. The results of these analyses confirm that the indirect effects of local market stakeholder pressures on green product innovation (indirect effect = 0.195, Boot SE = 0.090, 95% confidence interval = [0.049, 0.402], not including zero) and green process innovation (indirect effect = 0.218, Boot SE = 0.098, 95% confidence interval = [0.051, 0.430], not including zero) are statistically significant.

DISCUSSION AND CONCLUSIONS

The results from this study regarding the environmental management of Japanese MNC subsidiaries in North America and Europe revealed the complex mechanism through which subsidiaries "go green". Our empirical results have provided robust support for a series of proposed hypotheses. From both theoretical and managerial perspectives, the current study offers strategic implications for MNCs aiming to best leverage their organizational capabilities and re-engineer the process of creating value across borders in an efficient manner (Kolk & van Tulder, 2010). The main contribution of this paper is to focus on the mechanisms

underlying green innovation in MNC subsidiaries, and to explore how the two types of green innovation are influenced by the configuration of global institutional pressures (the level of participation in the global environmental regime) in host countries and local stakeholder pressures. Put it differently, this study conceptualized and empirically investigated a multilevel model of both green process and product innovations of MNC subsidiaries. There is plenty of anecdotal evidence that the overseas subsidiaries of Japanese MNCs do have considerable autonomy with regard to their environmental policies and initiatives to prevent the trade-off between economic efficiency and ecological responsibility. For example, Daikin Europe (DENV) is famous for taking the lead in the development of eco-friendly heat pump systems (Daikin, 2015). DENV now functions as a centre of excellence and leverage its knowledge pertaining to renewable energy is transferred to other subsidiary units in North America and Asia (Watanabe, 2015). Denso Manufacturing Hungary (DMHU) becomes a green pioneer in cutting the amount of its waste sent to landfill to zero within Denso Corporation's global network and received the 2004 Management Award for Sustainable Development (European Commission, 2004). Yazaki Saltano de Ovar Productos Eléctricos Lda (YSP) autonomously implemented operations to collect and recycle organic solvent, with the result that their waste disposal costs were reduced to zero (Yazaki, 2004). And Toyota Motor Manufacturing (UK) installed in 2010 Britain's largest solar photovoltaic panels to enhance energy performance (Toyota Motor Corporation, 2012).

This study builds on this anecdotal evidence, and provides a more formal analysis of the green innovation initiatives of MNC subsidiaries across a range of host countries with quite different attitudes to the global environmental regime, and hence provides a contribution to both the international business and the environmental management literatures. The findings from our empirical analysis suggest that market stakeholder pressures have a significant effect upon both green product and process innovations by local subsidiaries of MNCs via the

implementation of EMS initiatives by the MNC subsidiaries and that EMS implementation positively affects not only green product innovation performance but also green process innovation performance. Furthermore, our multilevel analyses show that the effects of market stakeholder pressures on EMS implementation are amplified in host countries which embrace good global environmental stewardship, thus lending support to the conceptual model of Lee (2011) regarding CSR strategies.

Theoretical Implications

Despite the increased attention placed on the environmental management initiatives undertaken by MNC subsidiaries, the empirical research pertaining to this issue has still been relatively scarce (Egri & Ralston, 2008; Holtbrügge & Dögl, 2012; Kolk & van Tulder, 2010). The findings of this study contribute to advancing the concept of environmental responsiveness in the international context in three unique ways. First, our study departs from the traditional dominance of single-country studies (Egri & Ralston, 2008; Holtbrügge & Dögl, 2012) and considers the implementation of proactive environmental strategies by MNC subsidiaries in different host nations. Second, consistent with Driessen and Hillebrand (2013), our study finds that EMS implementation provides a formal and informal coordination mechanism that ensures access to relevant information on stakeholder issues in the quest for new opportunities to enhance green innovation performance. Lastly, this study provides insights about whether, why, and how the joint effects of stakeholder pressures and global institutional conditions encourage MNC subsidiaries to engage in green innovation. Although market stakeholders in host countries directly influence the degree of EMS adoption, industrial consumer pressures alone might not be enough for improving environmental responsiveness in MNC subsidiaries. Our multi-level study clearly indicates that it is necessary to develop an integrative model that focuses on the complementary logic of stakeholder theory and institutional theory in the analysis of MNC subsidiaries' environmental proactivity. In order to better understand the

pathways through which stakeholder pressures in host country markets affect green innovation, scholars should take into account how the intensity of these pressures is determined by the penetration of global environmental norms in host country markets. The findings of our study provide strong support for Lee's (2011: 294) argument that "corporate social responsibility is not really a product of an individual firm's strategic decision, but an outcome based on an amalgam of institutional, stakeholder, and firm interactions."

Managerial Implications

The findings of this study have implications for policy-makers in host countries. It shows that MNC subsidiaries do undertake substantial amounts of green innovation (see Table 3), and that they stimulated in doing so by, in particular, pressures emanating from their suppliers and customers. If we accept that green innovation for host countries is a "good thing" (see the discussion in the Introduction) then, paraphrasing Lee (2011), it is clear that policy-makers need to establish an environment under which marginal and resource-deficient stakeholders are able to exert significant influence on powerful MNC subsidiaries. On a more positive note, many host countries already consider MNC subsidiaries as key sources of the technical and financial capital required to respond to local environmental problems (Christmann & Taylor, 2002). Furthermore, MNCs may also stimulate social and environmental awareness by the indigenous population, influencing public organizations to implement stringent environmental requirements in host countries (Aguilera-Caracuel et al, 2012) and promote more ecologically-sustainable development (Peng & Lin, 2008). Finally, host governments contemplating how to attract green foreign direct investments (FDI) as part of a broader economic development strategy should understand the antecedents and consequences of EMS adoption by MNC subsidiaries in a multilevel setting. To address environmental challenges including air toxics, hazardous waste, and water pollution in the local economy, policy-makers should consider MNC subsidiaries with high green technologies as

foreign agents, and devise new industry-specific clusters with much clearer purposes to facilitate the knowledge transfer of clean production processes from foreign to domestic firms. Kolk & Pinkse (2008), for example, highlight the fact that host governments should further promote solid cooperation between local niche players and leading global multinationals to spur the invention of more advanced green technologies. More effective implementation of legislation to embed not only local firms but also local scientists in green and global value chain systems governed by large MNCs should also be promoted.

Limitations and Suggestions for Future Research

The study is not without limitations. First, the sample size (n = 123) is relatively small, and this may account for the lack of statistical significance reported for some hypothesized relationships. The coefficient signs were all as expected, however, so a repetition of the study with a larger sample of MNC subsidiaries as well as with a multiple respondent approach per MNC subsidiary might well should generate more significant results. We would, however, stress that the data were all collected through primary survey research, and that appropriate measures were taken to avoid problems such as common method bias. Second, the sample consists of US and European subsidiaries in Japanese MNCs, hence generally advanced countries with strong records of commitment to global environmental stewardship. Future research might focus on MNCs from other home countries, and subsidiaries located in a variety of (advanced and developing) host countries where governmental influences might well be more important. Third, future research should also use an objective measure of an EMS such as ISO14001 participation in order to build confidence in our empirical evidence. Fourth, our sample of 123 subsidiaries may not be representative of all Japanese MNC subsidiaries as 50% of the sample was located in only four host countries. Future research might replicate this study, but using a larger sample of MNC subsidiaries located in a wider array of host countries – and in host countries with different levels of development (and hence with markedly different levels

of global institutional pressures). Finally, the data come from a cross-section of MNC subsidiaries at one point in time[10]. As Freeman (1984) suggests, managerial perceptions of stakeholders' salience changes over time, and it would be interesting to explore the dynamic nature of the stakeholder pressures – green innovation nexus through more fine-grained and longitudinal research designs. This would also enable consideration of endogeneity and reverse causation. EMS implementation may lead to more green innovation, but it is possible that more eco-innovations shape MNC subsidiaries' implementation of EMS. These caveats notwithstanding, we believe that our study has both established that MNC subsidiaries do undertake autonomous green product and process innovations, and investigated the antecedents of these initiatives.

[10] We would like to thank one of the reviewers for highlighting this limitation.

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APPENDIX: The Survey Questionnaire

Green product innovation (4 items; 5-point Likert scale: 1 = strongly disagree, 5 = strongly agree)

1. The company chooses the materials of the product that produce the least amount of pollution for conducting the product development or design.
2. The company chooses the materials of the product that consume the least amount of energy and resources for conducting the product development or design.
3. The company uses the fewest amounts of materials to comprise the product for conducting the product development or design.
4. The company would circumspectly deliberate whether the product is easy to recycle, reuse, and decompose for conducting the product development or design

Green process innovation (4 items; 5-point Likert scale: 1 = strongly disagree, 5 = strongly agree)

1. The manufacturing process of the company effectively reduces the emission of hazardous substances or waste.
2. The manufacturing process of the company recycles waste and emission that allow them to be treated and re-used.
3. The manufacturing process of the company reduces the consumption of water, electricity, coal, or oil.
4. The manufacturing process of the company reduces the use of raw materials.

Regulatory stakeholder pressures (1 item; 3-point Likert scale: 1 = not important, 2 = moderately important, 3 = very important)
How important do you consider each of the following influences on your subsidiary's environmental practices?

1. Local government.

Market stakeholder pressures (3 items; 3-point Likert scale: 1 = not important, 2 = moderately important, 3 = very important)
How important do you consider each of the following influences on your subsidiary's environmental practices?

1. Household consumers
2. Commercial buyers
3. Suppliers of goods and services

Societal stakeholder pressures (4 items; 3-point Likert scale: 1 = not important, 2 = moderately important, 3 = very important)
How important do you consider each of the following influences on your subsidiary's environmental practices?

1. Environmental groups
2. Community organizations
3. Labor unions

4. Industry or trade associations

EMS implementation (6 items; 5-point Likert scale: 1 = strongly disagree, 5 = strongly agree)
Our subsidiary systematically attempts to…

1. Voluntarily exceed government-imposed environmental regulations.
2. Incorporate environmental concerns in our business decisions.
3. Incorporates environmental performance objectives in our organizational plans.
4. Financially support environmental initiatives.
5. Measure our environmental performance.
6. Minimize the environmental impact of all our business activities.

Subsidiary innovation capabilities (4 items; 5-point Likert scale; 1 = strongly disagree, 5 = strongly agree)
Compared with our major competitors:

1. Our subsidiary introduced much more new lines of products/services in the past three years.
2. The products/services our subsidiary introduced were much newer.
3. Our subsidiary introduced more new processes /operating technologies in the past three years.
4. The processes/operating technologies our subsidiary introduced were much newer.

Table 1: Prior Conceptual and Empirical Studies on MNC Subsidiary Environmental Strategy

Studies/year	Sample size	Method	Response rate	Core findings/arguments
Muller (2006)	7 European automotive MNC subsidiaries in Mexico	Qualitative (Interviews)	-	Autonomous subsidiaries are inclined to be more proactively committed to tackling environmental issues.
Peng & Lin (2008)	101 Taiwanese MNC subsidiaries in China	Quantitative (Survey)	18.0%	Subsidiary resources (+) & local responsiveness pressures (+) affect green production practices. MNC subsidiaries improve non-financial performance by seeking to implement green production management.
Yang & Rivers (2009)	MNC subsidiaries in emerging economies	Literature review; theoretical framework development	-	This study presents a conceptual framework for the antecedents of local corporate social and environmental actions in MNC subsidiaries by synthesizing stakeholder and institutional perspectives. It is conceptualized that MNC subsidiaries implement local CSR practices in quest for social legitimacy when institutional distance between a home country and a host country is great.
Aguilera-Caracuel et al (2012)	128 MNCs & 1790 facilities in the USA, Canada, France & Spain	Qualitative (fsQCA)	-	Low environmental institutional distances between home & host countries facilitate environmental performance standardization within MNE networks.
Choi & Park (2014)	300 Korean MNC subsidiaries all over the world	Quantitative (Survey)	50.9%	Governments (+), NGOs (+) & media (+) are key factors that encourage MNC subsidiaries to pursue local environmental strategies. Pressures from customers & local communities do not significantly facilitate the adoption by subsidiaries of local EMPs.
Tatoglu et al. (2014)	193 MNC subsidiaries in Turkey	Quantitative (Survey)	19.3%	The adoption of voluntary EMPs is determined by stakeholder pressures (+), perceived polluting potential (+), customer focus (+) & competitive intensity (ns).

Notes: (1) EMPs = environmental management practices
(2) fsQCA = fuzzy-set qualitative comparative analysis

Table 2: The Host Countries of the Japanese MNC Subsidiaries

Host countries	Frequency	Global institutional pressure
United States	21	0.71
Czech Republic	18	0.77
United Kingdom	17	1.00
Germany	10	1.00
Hungary	7	0.75
Poland	7	0.82
France	6	1.00
Netherlands	6	0.95
Canada	4	0.93
Belgium	3	0.88
Portugal	3	0.89
Spain	3	0.85
Turkey	3	0.76
Italy	2	0.94
Mexico	2	0.85
Romania	2	0.65
Russia	2	0.75
Sweden	2	1.00
Denmark	1	0.95
Ireland	1	0.94
Montenegro	1	0.35
Slovakia	1	0.71
Switzerland	1	1.00
Total	**123**	0.85 (mean value)

Note: The global institutional pressure data come from 2005 Environmental Sustainability Index.

Table 3: The Correlation Matrix

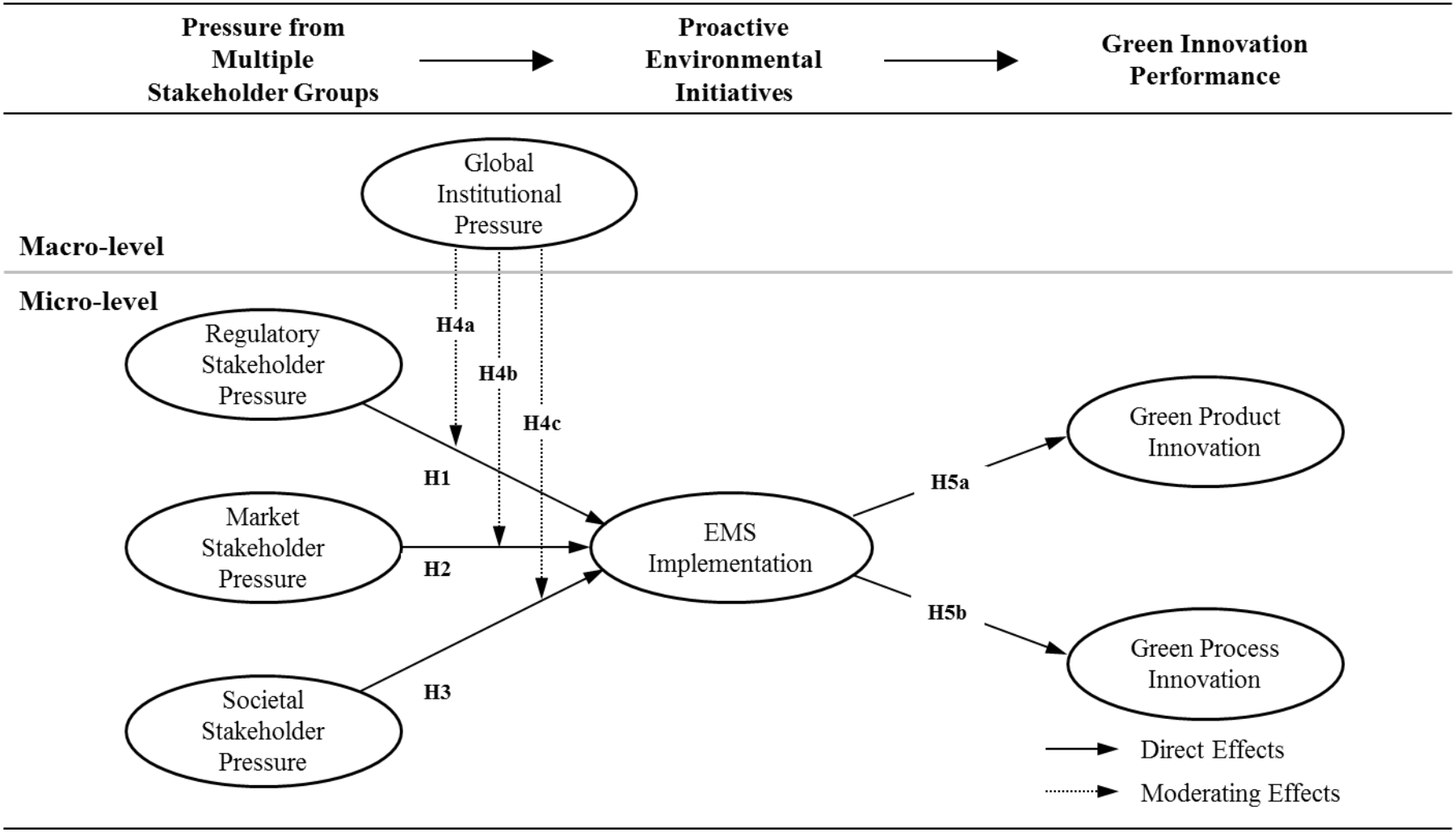
Variables		Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Regulatory stakeholder pressure	2.53	0.56	1.00	3.00	1.00												
2	Market stakeholder pressure	2.41	0.48	1.00	3.00	0.25	**0.74**											
3	Societal stakeholder pressure	1.99	0.45	1.00	3.00	0.52	0.32	**0.68**										
4	EMS implementation	3.40	0.80	1.17	5.00	0.19	0.23	0.22	**0.78**									
5	Green product innovation	3.70	0.82	1.25	5.00	0.16	0.20	0.15	0.52	**0.81**								
6	Green process innovation	3.75	0.72	2.00	5.00	0.10	0.16	0.05	0.64	0.67	**0.74**							
7	Subsidiary size (log)	2.39	0.57	1.08	4.11	0.06	0.03	0.21	0.23	0.26	0.21	1.00						
8	Subsidiary age (years)	21.64	17.29	1.00	107.00	-0.05	-0.12	-0.16	0.04	-0.14	-0.02	0.04	1.00					
9	Subsidiary innovation capabilities	2.98	0.75	1.00	4.75	-0.08	0.16	-0.02	0.28	0.34	0.28	0.06	0.07	1.00				
10	MNC parent size (log)	3.64	0.58	2.04	4.83	-0.08	-0.02	0.12	0.19	0.07	0.19	0.43	-0.05	0.04	1.00			
11	MNC parent age (years)	70.87	20.73	4.00	120.00	-0.23	-0.10	-0.10	-0.06	-0.10	-0.05	0.06	-0.14	-0.05	0.25	1.00		
12	MNC parent CSR performance	0.34	0.48	0.00	1.00	-0.01	0.11	0.07	0.26	0.21	0.27	0.24	-0.08	0.07	0.57	0.18	1.00	
13	Global institutional pressure	0.85	0.13	0.35	1.00	-0.11	0.17	0.12	0.08	-0.12	0.06	-0.19	0.26	0.21	-0.07	-0.04	0.00	1.00

Notes: (1) Sample size N = 123
(2) The figures in bold type indicate the square root of the average value extracted (AVE)

Table 4: The Constructed Variables

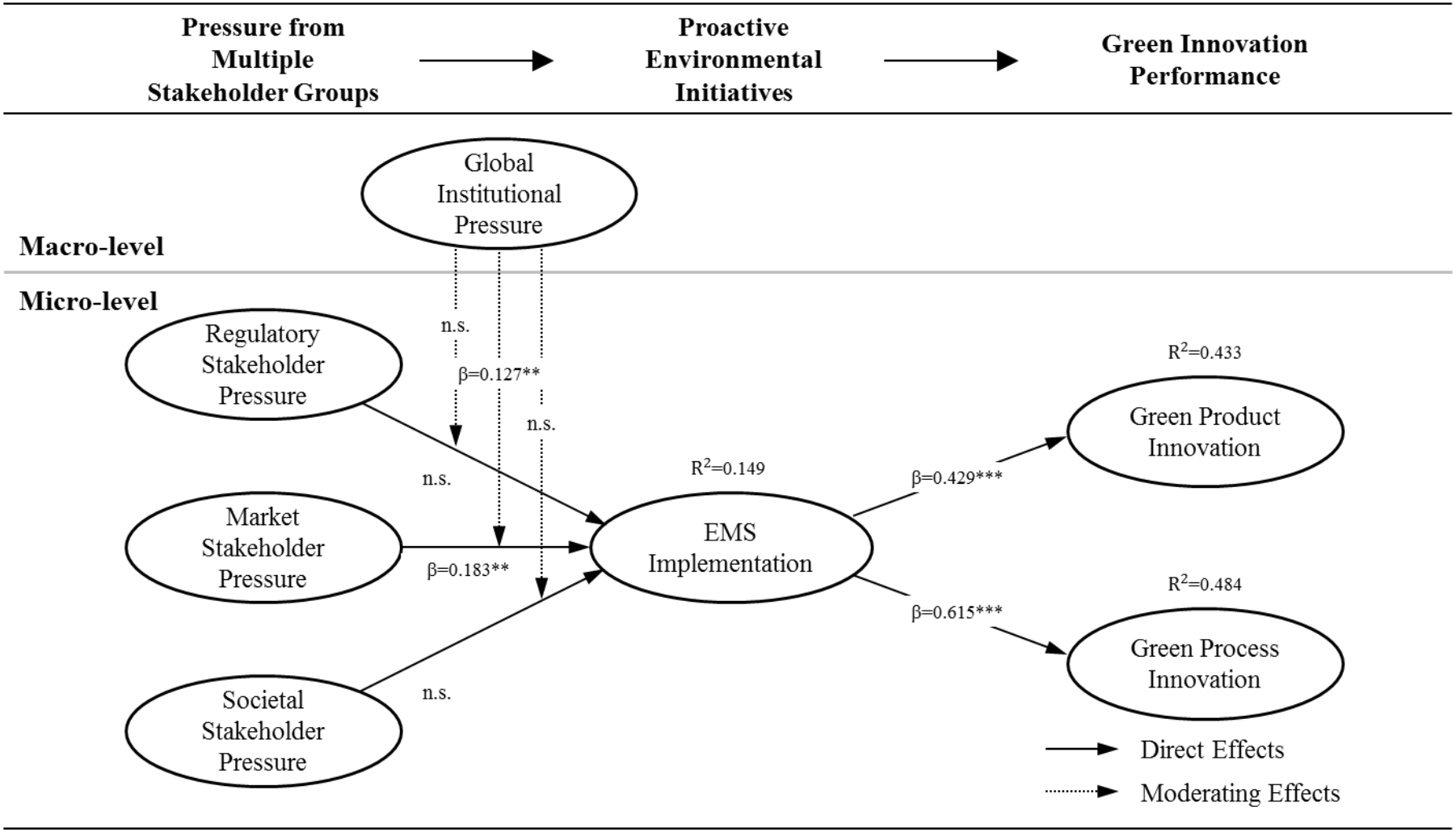
Scale	Number of Items	Range of Loadings	AVE	Composite Reliability	Cronbachs Alpha	R-square
Regulatory stakeholder pressure	1	-	-	-	-	-
Market stakeholder pressure	3	0.683-0.816	0.574	0.801	0.642	-
Societal stakeholder pressure	4	0.601-0.799	0.466	0.775	0.646	-
EMS implementation	6	0.612-0.871	0.602	0.899	0.863	0.149
Green product innovation	4	0.759-0.899	0.666	0.888	0.831	0.433
Green process innovation	4	0.671-0.814	0.551	0.830	0.727	0.484

Figure 1: The Proposed Theoretical Model



Note: EMS = Environmental management systems

Figure 2: PLS Analysis



Notes: (1) Sample size n = 123; (2) EMS = environmental management system; (3) Levels of significance: * = 10%; ** = 5%; *** = 1%; (4) n.s. = not significant

Figure 3: The Moderating Effect of Global Institutional Pressures on the Relationship between Market Stakeholder Pressures and EMS Implementation