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Foreign multinational enterprises and eco-innovation in local firms: The effect of imitation [1]

Yoo Jung Ha
Lecturer in International Business
The York Management School, University of York,
Freboys Lane, Heslington East
York, YO10 5GD, UK
+44 (0)1904 325011
yoojung.ha@york.ac.uk

Abstract

This paper investigates multinational enterprises (MNEs) as a potential referent for local firms making decisions on eco-innovation. By analyzing Korean innovation survey and patent data, we find local firms' eco-innovation scope converges with that of the most profitable foreign MNEs within an industry, i.e. profitability is considered a reliable signal for imitation. The imitation tendency changes contingent on previous eco-innovation experience and innovation networks with other local firms. The degree of imitation is then negatively associated with local firms' eco-innovation outputs. This study shows how local firms can use social proof from selected foreign MNEs to supplement their sense-making in a non-routine environment.

Keywords:

MNE; Eco-innovation; Imitation; Social proof; Non-routine environment

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Introduction

Firms are constantly faced with non-routine environments that destabilize current meanings and organizational routines (Romanelli & Tushman, 1994). The unpredictability and radical nature of such non-routine events call attention to a firm's ability to recognize and make sense of unexpected, confusing and complex problems to sustain its competitive advantages (Weick, Sutcliffe, & Obstfeld, 2005).

In this study, eco-innovation is construed as a non-routine event that may challenge an organization. Eco-innovation refers to the development and commercialization of products, processes and services that generate environmental benefits (Brunnermeier & Cohen, 2003). Going beyond the environmental management of existing resources, it involves a radical and systematic transition from profit-oriented business models to sustainable ones (Berrone, Fosfuri, Gelabert, & Gomez-Mejia, 2013). While any innovation involves imperfect information and complex problems, eco-innovation adoption is distinct in that the integration of sustainability into innovation processes entails substantive organizational, more than technological, changes (OECD, 2010; Tsoukas & Chia, 2002). Given the urgency of constructing meanings out of unforeseen, complex and confusing organizational challenges, heuristics, offering frugal but fast mental short-cuts, may prevail against systematic information-processing (Cornelissen, 2012; Rao, Greve, & Davis, 2001). Thus, recent studies have revealed the complexity of micro-foundations of eco-innovation decisions, emphasizing how an organization recognizes external situations and identifies plausible actions (Crilly & Sloan, 2012).

Monitoring other firms can shape the heuristics of a perceptive observer (Möller, 2010). Decisions made by multinational enterprises (MNE) offer important behavioral cues. MNEs are leading inventors of environmental technologies (Poelhekke & van der Ploeg, 2015) and can disperse eco-innovation in both home and host countries (Noailly & Ryfisch, 2015). In addition to owning and internally managing resources for eco-innovation, MNEs have unique experience in making sense of complex and equivocal implications of eco-innovation targets across countries (Carlile, 2004; Weick et al., 2005). In this view, MNEs can potentially transfer, translate and even transform the meanings of sustainability amongst local peers. On the other hand, domestic firms, other things being equal, can have an unequivocal influence on other local peers to navigate dynamic industrial change; therefore, foreignness alone may not be a significant behavioral cue (Jude, 2016). This conflicting interpretation of the position of MNEs in eco-innovation diffusion gives rise to a need to study what types of MNE may influence eco-innovation and sustainable

development in host countries, and how current foreign direct investment (FDI) promotion policy can contribute to sustainable development (Tatoglu, Bayraktar, Sahadev, Demirbag, & Glaister, 2014).

In this context, this study will examine to what extent foreign MNEs affect eco-innovation scope decisions in a local firm. When the value of decisions cannot be evaluated before adoption, a firm considers social proof, which refers to external heuristics found in other decision-makers' previous conduct (Rao et al., 2001). We propose that local firms may consider foreign MNE subsidiaries as social proof, as foreign MNEs can leverage internalization advantages to tap into corporate knowledge about best practices from different national institutional fields. There could be a historical bias if local firms have memories of referring to foreign-MNE decisions for general technological catching-up strategy.

We assume the selected social proof will affect the local firms' decision on eco-innovation scope as a result. Eco-innovation is marked by the emergence of new categories of targets and the enactment of new formats of activities (OECD, 2009). Decisions about the breadth of often hitherto unknown eco-innovation categories can challenge sense-making (Tsoukas & Chia, 2002). Thus, we propose a local firm may use social proofs such as foreign MNEs' prior decisions to make sense of the new categories and determine the appropriate eco-innovation scope.

Although social proof can offer fast and frugal short-cuts, imitation is a selective process. Thus, the first objective of this study is to identify which types of MNE appeal to local imitators as plausible social proof. Prior studies have shown that a perceptive imitator can use the attributes of other decision-makers to indirectly determine the appropriateness of their social proof (Deutsch & Gerard, 1955; Rao et al., 2001). Furthermore, the selection of social proof is entwined with the imitator's desire to reinforce their own identity, information-processing ability and conformity with powerful peers in the non-routine environment (Weick et al., 2005). Thus, this study explores whether local firms pick up social proof from foreign MNEs based on such conspicuous factors as desirable identity (as an eco-innovation leader), success (profitability), and power (size).

Some local decision-makers may be less concerned about imperfect information in the non-routine environment that the proliferation of eco-innovation may cause. According to social proof theory, imitation is contingent on the stability of imitators' identity and their willingness to use their own heuristics, acquired through prior experience in similar decisions (Festinger, 1954). Imitators' embeddedness in innovation networks may also cause bias in the selection of imitation targets (Deutsch & Gerard, 1955). Thus, this study will further examine the

degree and the outcome of imitation contingent on two moderators – a local imitator's prior experience in conducting eco-innovation, and its cohesive networks. These two moderators may reveal cases where the value of social-proofing practices from foreign MNEs meet boundary conditions.

Our dataset is based on the South Korean Innovation Survey of 2010, environmental patenting data and other national environmental statistics. Korea has recently introduced stringent environmental regulations comparable with OECD averages. Thus, many firms have already developed basic corporate attention to environmental issues. Given the short history of green-growth policy, however, local firms cannot rely on collective insights within local reference groups to determine an appropriate scope of eco-innovation. Having used imitation as a strategy for rapid technology upgrading in the past (Mathews, 2017), Korean firms may once again turn to social information obtained from foreign sources to complement endogenous locally-obtained social information.

This paper makes the following contributions. First, it empirically confirms imitation as a channel from which foreign MNEs influence local peers' decision-making in eco-innovation. We will conceptually suggest that foreign MNEs are a source of social proof in making sense of surprising, complex and confusing situations unfolding in a non-routine environment. Second, this study will also identify boundary conditions of the above effect of MNEs, by exploring the criteria local firms use for selecting imitation targets and its outcome. After discussing the importance of identity, cognition and power in selecting social proof, we will elaborate on how social proofing and imitation can be selective and also precarious when navigating non-routine environments (Chakrabarti, 2015). We also seek to contribute to the literature on imitation by considering foreignness as a criterion for the selection of social proof. We conceptualize the vividness of foreign MNEs, building on International Business scholars' portrayal of MNEs as boundary-spanners and cognitive entrepreneurs connecting national boundaries.

Theory & hypotheses

MNEs and social development in host economies

International Business scholars have viewed MNEs as boundary-spanners (Birkinshaw, Ambos, & Bouquet, 2017). MNEs have a distinct capability to create, retain, and transfer tacit knowledge through internalized mechanisms across foreign subsidiaries (Argote, McEvily, & Reagans, 2003; Frenz & Ietto-Gillies, 2007; A. K. Gupta & Govindarajan, 2000). The subsidiaries can then provide opportunities for local firms to observe and learn from

knowledge spilt over (García, Jin, & Salomon, 2013; Herrigel, Wittke, & Voskamp, 2013; Javorcik, 2004; Zhang, Li, & Li, 2014). In addition to knowledge spillovers for economic performance, the boundary-spanning activities of MNEs can affect social development in host countries, such as gender equality, corruption prevention, and human-rights protection (Kwok & Solomon, 2006; Siegel, Pyun, & Cheon, 2019; Young & Makhija, 2014).

Likewise, foreign MNEs can have implications regarding the diffusion of eco-innovation. Increasing engagement of business in sustainability issues is marked by unanticipated and radical organizational changes (Hart, 1995; Murillo-Luna, Garcés-Ayerbe, & Rivera-Torres, 2008). Leveraging the disparities between cross-national formal and informal institutions, MNEs can preempt local firms in recognizing the impact of environmental issues on business in a country (Aguilera-Caracuel, Fedriani, & Delgado-Márquez, 2014; Rugman & Verbeke, 2002). Local spectators may perceive that an MNE's practices have been demonstrably endorsed in the international arena. However, with previous studies paying attention to MNEs' role in eco-innovation diffusion, empirical evidence is limited.

A well-known mechanism of general technology diffusion between foreign MNEs and local firms is imitation. According to Zhang, Li and Li (2014), MNEs may not deliberately instruct local peers, but allow 'imitation from a distance' in a host economy. Kwok & Tadesse (2006) suggested the movement of professionals facilitates inter-firm mimesis between local firms, as followers, and MNEs, which hold the target practices and act as transnational change agents across national institutional fields. Past studies have consequently proposed foreign MNEs as potential mimetic drivers of socially-desirable practices and progressive social norms (Cole, Elliott, & Fredriksson, 2006; Fosfuri, Motta, & Rønde, 2001; Guler, Guillén, & Macpherson, 2002; Husted & David, 2006; Kwok & Solomon, 2006). However, it has yet to be demonstrated to what extent local firms actually imitate foreign MNEs and whether the performance outcome of imitation is necessarily positive.

Overall, this study seeks to find empirical evidence of the effect of foreign MNEs on eco-innovation scope in local firms, and explores imitation as a mechanism. The next section will present hypotheses, as summarized in Figure 1, and establish the rationale and process of imitation from foreign peers among local followers, outcomes of imitative choices of eco-innovation scope, and boundary conditions.

Insert Figure 1 about here

Imitation of foreign MNEs

The use of heuristics is a firm's attempt to make sense of non-routine situations (Fiol & Lyles, 1985; Suarez & Montes, 2019). As a concept, heuristics emerged as an individual-level element in social psychology, but was adopted by organization researchers to propose how an external reference group can shape a focal organization's perception and behavior (Cialdini, Wosinska, Barrett, Butner, & Gornik-Durose, 1999). Heuristics is based on an organization's own history and identity within an organization (Weick et al., 2005); it can also be applied in an inter-firm setting, and firms can boost sense-making of the others in a non-routine environment (Nikolaeva, 2014).

Rao et al. (2001) understood imitation as an attempt to use a socially-constructed heuristics, or social proof – social rather than scientific, as imitators have no way to evaluate a copied decision before adopting it in-house. Rao and colleagues showed how social proof becomes vivid enough to trigger imitation when it originates from a majority decision-maker holding high status in the group, or when the decision is recent rather than historic. Bingham and Eisenhardt (2011) cite a case of a high-tech venture which used 'the deliberate rule of thumb' based on common practices in a number of Taiwanese peers before deciding to collocate R&D and manufacturing functions in China, to avoid data-intensive analysis of different modes of operation in China.

To what extent foreignness can increase the vividness of social proof is an intriguing topic. Studies of technological development cycles show that many latecomer firms have upgraded to become technology leaders by duplicative imitation of foreign technology-leaders' decisions (Miao, Song, Lee, & Jin, 2018). Thus, these firms could have a historical bias towards acquiring social proof from foreign MNEs when new technological trends emerge. On the other hand, not all foreign MNEs are considered useful as social-proof sources in a current non-routine environment. In the face of highly dynamic industrial change, decision-makers' concerns are specifically how to restore insecure identity and limited information-processing capabilities to adapt to the dynamic changes and the desire to follow the influencer's trend-setting decisions (Bingham & Eisenhardt, 2011; Maitlis & Sonenshein, 2010). Only certain foreign MNEs can meet these new demands.

Given the saliency of identity, information-processing capability and power to influence the market in the non-routine environment, this study proposes that local firms may select a foreign MNE as an imitation target with the motivation to address de-stabilized identity (*imitating the desirable*), supplement limited cognitive ability in a non-routine situation (*imitating the successful*), and arrest the fear of missing a trend that influencers are driving in the market (*imitating the powerful*).

First, local imitators may select foreign MNEs to enhance their identity. In a non-routine environment, a de-stabilized identity is a key impediment to sense-making for new problems (Weick et al., 2005). Emulating the decisions of desirable clusters of firms can help enhance imitators' identity (Jensen and Kim 2014). Thus, local followers may follow decisions in those MNEs deemed to possess desirable and legitimate traits, such as having the broadest eco-innovation scope in the industry.

Moreover, imitators may select imitation targets based on MNEs' successful performance. The use of social proof is intended to address an imitator's limited cognitive capabilities. Other organizations that have achieved strong performance can indirectly signal superior information-processing capabilities to identify appropriate eco-innovations (Haunschild & Miner, 1997). While the accuracy of the signal may remain questionable, it can deliver a plausible story to rationalize the benefit of the chosen eco-innovation scope. Thus, local firms may more readily emulate foreign MNEs that conduct eco-innovation and achieve high profits thereby.

Foreign MNEs with more powerful positions in the market can also be selected as imitation targets. Power and influence are key constructs in sense-making in complex environments (Maitlis & Sonenshein, 2010). Some organizations with a strong market position may independently construct meanings from a non-routine situation, while others may draw meanings advocated by more powerful peers. Such follower behavior could reflect a fear that not tracking influential trends might leave the organization lagging behind (Semadeni & Anderson, 2010). We therefore argue that local firms may imitate MNEs that are large and with an established position in the market.

Thus, three hypotheses about the selection of MNEs for imitation are as follows:

Hypothesis 1a: The presence of foreign MNEs which have engaged a superior scope of eco-innovation is positively related to the likelihood that a local firm will adopt a similar eco-innovation scope to those foreign MNEs.

Hypothesis 1b: The presence of foreign MNEs which have attained superior profitability is positively related to the likelihood that a local firm will adopt a similar eco-innovation scope to those foreign MNEs.

Hypothesis 1c: The presence of foreign MNEs with superior market position is positively related to the likelihood that a local firm will adopt a similar eco-innovation scope to those foreign MNEs.

Imitation and eco-innovation outcome

Imitators select social proof based on perceived plausibility rather than objective proof. Sometimes imitation is imperfect and based on a wrong target. Thus, the use of social proof can result in later disappointment and the abandonment of the imitated practices (Rao et al., 2001).

First, a selection of unsuitable imitation target may be partly related to the imperfect observability of MNEs' practices. The selected social proof can lack tacit information in the first place, or the source firm may not reveal much information about the correct implementation of the practice (Gaba & Terlaak, 2013; Sembenelli & Siotis, 2008). Even when sufficient information is revealed and a correct role model selected, imitators can experience incompatibility between their own organizational resources and the imitated practices (Posen, Lee, & Yi, 2013; Zhang et al., 2014). All these factors detract from learning-by-imitating.

Second, blindly duplicating foreign MNEs' decisions may be a second-best strategy when there are neighboring local firms with industry leadership in technology and sustainable management. Miao et al. (2018) for instance noted that East Asian firms can now find alternative benchmarks where catch-up has been completed or has exceeded foreign MNEs. Imitation then would be only a stopgap strategy rather than creative path-breaking (Lee & Malerba, 2017).

However, imitation can sometimes incur accidental learning opportunities (Xia & Liu, 2018) if foreign MNEs reveal eco-innovation know-how to local firms. Inter-firm human exchanges and competition are well-known horizontal channels for transferring technologies and managerial knowledge, eventually causing behavioral convergence between foreign and local firms within the same industries (Blomström & Kokko, 1998). Through transactional linkages between vertically-related industries, a foreign MNE can also transfer environmental standards and solutions (Husted & David, 2006; Kwok & Solomon, 2006; Zhu, Cordeiro, & Sarkis, 2013). As a downstream buyer, it can provide local suppliers with templates for dealing with ambiguity and uncertainty in eco-innovation (DiMaggio & Powell, 1983; Lieberman & Asaba, 2006). Thus, although imitation from foreign MNEs' practices is based on social proof, it can result in vicarious learning opportunities.

This study therefore takes the view that performance outcomes of imitated eco-innovation can be mixed. Imitation can offer positive benefits of learning and simultaneously entail limitations. Thus, we propose:

Hypothesis 2a: Eco-innovation scope imitated from foreign MNEs is positively associated with a local firm's eco-innovation performance.

Hypothesis 2b: Eco-innovation scope imitated from foreign MNEs is negatively associated with a local firm's eco-innovation performance.

The moderating effects of past experience

As discussed earlier, social proof is a substitute for internal heuristics that can be bounded under high uncertainty (Deutsch & Gerard, 1955). When a firm believes in its own judgment, it may avoid blindly duplicating others' decisions (Csaszar & Siggelkow, 2010; Posen & Martignoni, 2018; Rivkin, 2000).

Experience is an important guide to an organization's own heuristics under uncertain conditions (Cohen & Levinthal, 1990). A firm that has successfully conducted eco-innovation may know local technological and institutional contexts better than industry peers and can depend on its own assessments. Pre-existing knowledge and experience can strengthen belief in its own judgment, thereby reducing reliance on social proof and imitation. Furthermore, internal members and stakeholders can favor their own internal heuristics. Trusting past experience of eco-innovation, employees and stakeholders can take pride in their own judgment (Terlaak & King, 2007), whereas following other firms can be considered demeaning to organizational pride and reputation amongst stakeholders. Thus, we argue that past experience of eco-innovation weakens the motivation to adopt social proof, and thus:

Hypothesis 3a: A local firm's past experience of eco-innovation negatively moderates the degree of imitation from foreign MNEs.

Although it may weaken the imitator's reliance on social proof, past experience can generate a synergy with social proof. Experience may facilitate selection of reliable social proof that can guarantee positive performance improvement (Cohen & Levinthal, 1990). On the other hand, it is also known that experience can distract an imitator's attention during the post-imitation learning process. When information about imitation targets is imperfect, imitators attempt to fill the knowledge gap with their own experiences (Posen et al., 2013). In this case, the focus of attention can be torn between imitated and unimitated aspects of the eco-innovation decision, detracting from learning as a result (Posen & Martignoni, 2018). Thus:

Hypothesis 3b: A local firm's past experience of eco-innovation negatively moderates the effect on eco-innovation performance of imitation from foreign MNEs.

The moderating effects of innovation networks

The use of social proof is further contingent on network embeddedness. Network membership can develop bias towards familiar members (Gulati, 1995). While local firms may find alternative insights from foreign MNEs useful to close voids in collective heuristics in local networks, foreign MNEs may not be embedded in local innovation networks (Johanson & Vahlne, 2009). Deutsch and Gerard (1955) noted that social proofs found in a well-structured network are likely to be adjudged as more reliable than those from outside the network. In this case, information obtained from a structured and local cohesive network is preferred over social proof deriving from foreign MNEs (Deutsch & Gerard, 1955). Thus:

> **Hypothesis 4a:** A local firm's innovation network negatively moderates the degree of imitation from foreign MNEs' eco-innovation scope.

Foreign MNEs' limited network embeddedness may also affect the outcome of imitation. As mentioned above, post-imitation learning requires the imitator's efforts to address imitation gaps which the limited observability of the imitation target may cause (Posen & Martignoni, 2018). When there are innovation networks, the imitator may attempt to replace unobserved information with information obtained from nearby innovation networks; however, the two information sets may not be compatible, given institutional distance and different organizational foundations. The post-imitation learning process can be easily deflected from the initial imitation target. Thus, innovation networks can reduce the effect on a local imitator's performance outcome of practices imitated from foreign MNEs, and we therefore hypothesize:

> **Hypothesis 4b:** A local firm's innovation network negatively moderates the effect of imitation from foreign MNEs' eco-innovation scope on eco-innovation performance.

Data and methodology

Data

To test the hypotheses, we selected Korea as the empirical context in which to observe the interplay between foreign MNEs and local firms. In 2014, environment-related green taxes were equal to 2.54 percent of GDP in Korea, compared with 2.49 percent in OECD Europe and 1.61 percent OECD overall. However, environmental regulations

in Korea do not correlate to firms' proactive green responses: only 9.59 percent of technologies in Korea were environment-related in 2014, compared with 11.35 percent in OECD Europe and 10.45 percent in OECD overall. This mismatch between institutional stringency and pace of change in the local industry might indicate a slow catching-up of managerial cognition and attention, despite institutional and technological changes in favor of proactive environmental strategies. Thus, Korea is a useful empirical context to test whether foreign MNEs' demonstration of eco-innovation can affect decision-making and performance in local firms.

This research is based on various secondary data. The main source is the Korean Innovation Survey (KIS) for 2010, a national survey administered by the Science and Technology Policy Institute under the framework of the OECD's Oslo Manual Version 3. Its questionnaire sought quantitative and qualitative information concerning firms' innovation activities, including environmental innovation. Responses were based on activities that took place in the period 2007-2009. The survey collected 3,925 responses, a response rate of 51 percent (See Table 1). KIS data was further supplemented by other official statistics from the Ministry of Environment and Statistics Korea. We also extracted total counts for environmental patents applied for by individual local firms from the Korean Intellectual Property Office (KIPO)'s database, following OECD definitions of eco-patents (OECD, 2014).

Insert Table 1 about here

Measures

Eco-innovation

Our dependent variable is eco-innovation performance, measured by counts of environmental patent applications. Patent applications have been used as an indicator of the extent of innovation projects in a firm (García et al., 2013). As such, we focus on successfully-implemented environmental innovation projects; attempted eco-innovation was excluded if a substantive outcome was not achieved. We use environmental patent data for 2012 and allow a three-year lagged effect of local firms' imitation from foreign MNEs' eco-innovation adoption as reported in 2007-2009 (Haskel, Pereira, & Slaughter, 2007). An alternative measure of performance could be environmental investment, but this is an input-based indicator that cannot indicate whether investment was successful or not (Carrión-Flores & Innes, 2010; Jaffe & Palmer, 1997).

We also measure eco-innovation scope in local firms and foreign MNEs, the context of imitation in this paper. We obtained the eco-innovation scope measure based on self-reported data in the KIS survey covering 2007-2009; our measure follows Horbach, Rammer, & Rennings (2012). This indicator will be used later to identify a group of MNEs with strong eco-innovation leadership and to calculate the imitation measures. In the survey, a firm was assigned a value of 1 if it conducted eco-innovation in one of nine areas of environmental technologies identified by the OECD's survey manual as distinct categories, and 0 if it did not. The eco-innovation scope is defined as the total score of the nine eco-innovation areas. The largest eco-innovation scope scored nine, and the smallest zero. Specifically, those nine areas comprise: environmental process innovations for 1) improving resource efficiency; 2) improving energy efficiency; 3) reducing CO^2 emissions; 4) reducing hazardous waste; 5) cutting pollution; 6) promoting recycling and use of renewable energy; 7) environmental product innovations for developing energy-saving products; 8) developing pollution-cutting products; and 9) developing recyclable products.

MNEs

Following past studies, we measure the presence of MNEs adopting eco-innovation by calculating their share of R&D expenditures in the industry's total (Haunschild & Miner, 1997; Lu, 2002; Williamson & Cable, 2003; Zhang et al., 2014). Among firms identifying themselves as an affiliate of a foreign MNE, we focused on those replying to the KIS survey that they had conducted eco-innovation in 2007-2009. To reflect the selective imitation process, we further identified three groups of foreign MNEs and computed their ratios in industries.

The first group of MNEs comprised those leading the rest of the industry in terms of strong identity as eco-innovators. The visible presence of this group is measured by *MNE_green,* which is the ratio of foreign MNE subsidiaries whose eco-innovation scope was greater than the local industry average. The second group of MNEs possessed the ability to generate profit returns from eco-innovation activities. *MNE_profit* is a proxy of this second group and is measured by the ratio of foreign-MNE subsidiaries reporting profit rates higher than the industry average. The third group of MNEs consisted of foreign MNEs with the power to influence the market. To measure *MNE_size*, we identified subsidiaries whose employment size exceeds the industry average. All three indicators are based on the two-digit classification in Korean Standard Industrial Classification (SIC). We focused on within-industry imitation rather than intra-regional imitation, as Korea has a small geographical area, and geographical distribution of FDI is heavily concentrated in certain industrial clusters.

Imitation

Our measure of the degree of imitation builds on Salomon and Wu (2012) (See Eq. (1)). We consider three imitation measures: imitation of the desirable (*Imitate_green*), imitation of the successful (*Imitate_profit*), and imitation of the powerful (*Imitate_size*). For instance, for Imitate_green, we calculate the mean score (*Mean* ($EI_{f,j.}$)) and the standard deviation of eco-innovation scope of the 'f' number of foreign MNEs in the j[th] industry (*Standard Deviation* ($EI_{f,j.}$)). $EI_{i,j}$ is eco-innovation scope in the i[th] local firms in the j[th] industry. The equation's numerator shows the difference between a local firm's eco-innovation scope and the mean eco-innovation scope amongst foreign MNEs within the same industry. This is divided by the standard deviation of eco-innovation scope amongst foreign MNEs. This is then converted into absolute value and multiplied by (-1); a higher score indicates a high degree of imitation.

$$Imitate\_type_{ij} = \left\{ Absolute\ Value \left[\frac{EI_{ij} - Mean\ (EI_{fl})}{Standard\ Deviation\ (EI_{fl})} \right] \right\} \times (-1) \quad (1)$$

Other independent variables

Following Gupta and Misangyi (2018), past experience of eco-innovation is measured by total environmental patent applications made in 2004-2006, to capture prior experience before KIS 2010. Past patent stocks represent not only stock of innovation outputs obtained from previous years, but also proxying the perceived reliability of firm's own judgment.

Innovation Network is a dummy variable based on the KIS survey question asking whether a firm has innovation collaboration with any business or institutional partners. It is used as a proxy for alternative social proofs with a structure more organized than that obtained from distant observation regarding a group of MNEs.

Control variables

We controlled for other firm-level factors that could influence a domestic firm's eco-innovation (See Table 2). R&D intensity is R&D expenditures relative to the firm's sales. The size of a local firm is measured by the log-transformed number of employees (Darnall, Henriques, & Sadorsky, 2010). Business Group is a dummy variable based on the KIS survey question asking whether a firm had engaged in R&D cooperation with affiliates in the same business

group, to control for intra-organizational transfer of knowledge (De Marchi, 2012). Technology License is the log-transformed value of technological licensing fees.

To represent other social and institutional factors, we adopted Subsidy and Linkages. To control for the effects of policy instruments other than green tax, Subsidy is based on a KIS questionnaire asking whether a domestic firm had received government fiscal support for general technological innovation during 2007-2009, and is a dummy variable encoded 1 if the fiscal support received was greater than zero. Linkages is measured by the ratio of transactions with industrial downstream customers in a firm's total sales and was obtained from KIS data. We assume that the effects of policy instruments can be indirectly transferred and amplified through industrial linkages, moving from downstream to upstream sectors.

We also control for industry-level factors. Green Taxes is the growth rate of total environment-related taxes levied by the Korean government in 2007-2009 on all firms in the region where the firm is located. The data was obtained from Statistics Korea's database. Competition, measured by the Herfindahl index in industry, is a proxy for market structure. The presence of other foreign MNEs (Other Foreign MNE) not conducting eco-innovation locally is included to control for foreign competition. Clockspeed is the perceived lifespan of the firm's dominant product in the market. Based on Nadkarni and Naryanan (2007), those reporting a lifespan of less than three years are coded as 5 for (high clockspeed), less than 10 years as 4, less than 40 as 3, semi-permanent as 2 and permanent as 1.

Insert Table 2 about here

Estimation strategy

All models are estimated by the ordinary least squares (OLS) method. Our data is cross-sectional. To control for simultaneous effect between dependent and key independent variables, the three foreign-MNE presence indicators (*MNE_green, MNE_profit, MNE_size*) are instrumentalized. Eco-innovation scope in foreign MNEs and local firms could be correlated even without imitation if foreign MNEs selected sectors where local firms already had a similar scope of eco-innovation, and this endogeneity bias needs to be addressed.

First, we selected Relative Comparative Advantage (RCA) as the instrumental variable. It is measured in two-digit industries for 2007 and we collected this from the Korea Institute for International Economic Policy and

the Korea Institute for Industrial Economics and Trade. We assigned a value of 1 if the RCA score was greater than 1 (meaning South Korea has comparative advantages in the concerned industry) and 0 otherwise. Second, we formulated three equations for respective indicators of MNE presence (*MNE_green, MNE_profit, MNE_size*), which assumed that the entry of relevant foreign MNEs was in response to comparative advantages in that local industry, not by the potential salience of eco-innovation (See Eq. (2)). Two control variables were included: industry competition, measured by Herfindhal, and industry dummies. Finally, from each equation, we calculated the predicted value for each of *MNE_green, MNE_profit, MNE_size* to use for the estimation of our main model.

$$\text{MNE\_type}_j = \pi_0 + \pi_1 \text{RCA}_j + \pi_2 \text{Competition}_j + \text{Industry dummies} + \mu_j \quad (2)$$

Another bias is that local firms conduct eco-innovation anyway, with or without MNEs. Thus we calculated this selection bias as Inverse Mills Ratio and entered it in the models with the dependent variable of eco-innovation performance.

Empirical results

Table 3 is a correlation matrix and descriptive statistics. Table 4 contains two sets of regressions. The first three regressions concern local firms' imitation of foreign MNEs' eco-innovation scope. The following three regress local firms' eco-innovation performance on the degrees of imitation. Table 5 contains tests of moderators' effects. F-statistics or Chi-square statistics of all regression models are statistically significant.

Insert Tables 3, 4 and 5 about here

Imitation of foreign MNEs

Hypothesis 1 concerns the extent to which local firms select certain categories of foreign MNEs as imitation targets. In Table 4, Model 1 shows the coefficient of *MNE_green* is not significant (b=2.257, $p \geq 0.10$), i.e. there is no statistical evidence in favor of the proposition that local firms imitate eco-innovation scope decisions in foreign MNEs with a salient legitimate status due to an industry-leading advanced eco-innovation scope. Model 2 reports a

positive and statistically significant effect of *MNE_profit* (b=3.756, p<0.01), and in Model 3 *MNE_size* has a negative effect (b=-20.840, p<0.01). Thus, H1a and H1c cannot be confirmed, but H1b can be accepted. The findings show that local firms do not imitate based on the imitation target's identity as a green organization. Instead, foreign MNEs demonstrating high profitability exert a positive effect on imitation. When the foreign MNEs are large, local firms are likely to avoid rather than follow them; thus, the perception of power reduces a potential imitator's bias towards large MNEs.

Imitation and eco-innovation outcome

H2a and H2b are about the mixed effect of the imitated eco-innovation scope on local firms' eco-innovation performance. Models 4 and 5 report negative effects from both *Imitate_green* (b=-0.012, p<0.10) and *Imitate_profit* (b=-0.052, p<0.01). In Model 6, there is no significant effect from *Imitate_size* (b=-0.005, p≥0.10), although the sign indicates a possible negative outcome of imitation. The findings show that an imitated eco-innovation scope results in reduced eco-innovation output. Thus, H2a is rejected and H2b – that eco-innovation scope imitated from foreign entrants is negatively associated with a local firm's eco-innovation performance – is supported, with reference to local firms' imitation of desirable and successful MNEs.

The moderating effects of past experience

Our H3a and H3b are about negative moderating effects of a local imitator's past experience. As the earlier regressions found a significant outcome of imitation only from MNEs that have achieved salient profitability, the rest of the analysis focuses on moderating effects on the relationship between *MNE_profit* and *Imitate_profit*, and that between *Imitate_profit* and *Eco-innovation*. In Table 5, Model 7 reports a negative moderating effect of past experience (b=-0.057, p<0.01) on the degree of imitation from profitable foreign MNEs. Model 8 then reports another negative moderating effect of past experience (b=-0.056, p<0.10) on the effect of imitation on the imitator's eco-innovation performance. This means that when a local firm has rich past experience of eco-innovation projects, it is less likely to imitate foreign MNEs. Furthermore, this local firm, even if it may imitate, may not learn from an imitated decision. Thus, H3a and H3b can be supported.

The moderating effects of innovation networks

Our H4a and H4b concern the negative moderating effects of a local imitator's innovation networks. In Table 5, Model 9 reports no significant moderating effect of innovation networks (b=-1.000, $p\geq0.10$) on the imitation of the profitable foreign MNEs. This means that the cognitive bias a local firm develops regarding the correctness of a foreign MNE's decision is not distracted by the presence of innovation networks. Model 10, however, reports a negative moderating effect of innovation networks (b=-0.081, $p<0.10$) on imitation's effect on eco-innovation performance. This means that innovation networks can distract the learning-from-imitation process. Thus, H4a cannot be accepted, but H4b can be accepted.

Figures 2 and 3 present more details about the interaction effects. Overall, the figures are in line with the interpretations of the regression tables. In Figure 2-a, both lines have positive slopes, showing that the presence of foreign MNEs with high profitability increases imitation in firms with both high and low past experience. However, the slope is less steep when a firm has previous experience, indicating a substitution effect of past experience. Figure 2-b shows the outcome of imitation on imitators' eco-innovation performance to be negative where past experiences are abundant, but positive with limited experience.

In Figure 3-a, eco-innovation performance declines after imitation at the same rate in firms with or without an innovation network, and this shows that an innovation network does not moderate a firm's imitation propensity. In Figure 3-b, the outcome of imitation has negative slopes, but a firm with an innovation network has a steeper negative slope than one without.

Insert Figures 2 and 3 about here

Discussion & conclusions

Discussion of findings

The need to manage natural environments in a sustainable manner is a key global challenge (George, Howard-Grenville, Joshi, & Tihanyi, 2016), as well as a new economic growth model (OECD, 2010). This study explores imitation as an action to facilitate sense-making and decision-making through the unexpected, complex and confusing problems involved in eco-innovation adoption. We have considered under what conditions foreign MNEs

can be possible imitation targets that can supplement socially-constructed heuristics amongst local firms in a host country.

Our empirical findings are three-fold. To begin with, we find foreign MNEs affect local firms seeking social proof from successful peers. Social proof found in successful MNEs can address local firms' anxiety about bounded information-processing capabilities. However, we did not find evidence that desirable traits alone, such as an industry-leading eco-innovation scope, will make MNEs plausible benchmarks. Thus, foreign MNEs are not an appealing imitation target when local firms seek social proof for the restoration of identity and legitimacy in a non-routine environment. Furthermore, we found that local imitators' propensity to imitate foreign MNEs may even decline if foreign MNEs are too big. While we predicted local firms would recognize powerful MNEs as major trend-setters, our result shows that local followers may be motivated to pursue differentiation from foreign rivals rather than convergence. As a result, we conclude that local firms adopt a similar eco-innovation scope to foreign MNEs when their strategy is to imitate the successful, but do not target foreign MNEs simply because they look desirable or have influential market positions.

Secondly, our findings show that preferences for social proof in local firms can be weaker if a firm's own past experience is sufficiently strong. This finding is in line with social proof theory's assumption that the use of heuristics based on social proof is to prevent erroneous own-decisions in an organization under bounded rationality (Rao et al., 2001). Nevertheless, imitation is not negatively affected by other innovation networks that may offer alternative social proofs. In social proof theory and psychic distance research, cohesive networks are a more reliable vehicle for a local firm to follow, and foreigners lie outside the local network (Deutsch & Gerard, 1955). Hence, it is concluded that local followers' bias in favor of foreign social proof, once developed, cannot be easily compromised by alternative bandwagons from well-established domestic peers.

Thirdly, imitation of foreign MNEs may not lead to learning and development of eco-innovation capabilities in local firms. This result is conceptually in line with imitation researchers' findings concerning imitation barriers and the difficulties of managing attention during the post-imitation process when the target practice is not fully observable and the imitator is exposed to diverse alternative resources (Posen & Martignoni, 2018; Terlaak & King, 2007). We furthermore suggest that a negative learning outcome from inter-firm imitation is attributable to the fact that imitation is a means of sense-making to construct stories that are plausible, rather than collecting information to support learning. This finding shows that foreignness-based imitation does occur, as predicted in International

Business literature (Zhang et al., 2014), but the positive outcome of imitation is materialized under far more restrictive conditions than previously assumed, and that the process and outcome of imitation between foreign MNEs and local firms is in line with social proof theory.

Contributions and managerial implications

This paper makes some research contributions. First, it confirms that foreign MNEs can influence eco-innovation decisions amongst local firms in the host country. Eco-innovation is an example of non-routine events that disrupt firms' current identity and routines. While prior research has focused on the role of deep organizational learning in organizational transformation from extant resource-intensive practices into environmentally-sustainable ones, organizational science research has shown the relevance of heuristics to non-routine environments (Chakrabarti, 2015; Fiol & Lyles, 1985). In this study, imitation is proposed as a mechanism for local firms to monitor social proofs in foreign MNEs and develop heuristics to facilitate sense-making and decision-making on eco-innovation. Thus, our contribution is to show that FDI and MNE activities can support the development of local firms' fundamental capabilities to select appropriate heuristics and address non-routine problems (Dobrev, 2007; Rao et al., 2001).

Our second contribution is that we reveal the complex process and boundary conditions of imitation. Existing studies, either based on the knowledge-based view or institutional theory, have assumed rational imitation strategies (De Marchi, 2012; Delmas & Montes-Sancho, 2010). In the knowledge-based view, imitation is a channel valuable for knowledge spillovers for learning. The institution-based view proposes mimetic behaviors to conform to stakeholder pressures and enhance legitimacy. In this study, we additionally suggest that imitation involves a distinctive set of motivations – for instance, the intention to restore bounded information-processing capabilities, identity and power – and this accordingly predicts what type of social proof imitators will favor (Weick et al., 2005). Furthermore, the accuracy of the social proof cannot be evaluated before imitation is completed, and as a result imitation does not necessarily guarantee successful learning-by-imitating. Thus, we show social proofing and imitation to be a precarious process with uncertain outcomes, and accordingly report boundary conditions of foreign MNEs' effect on local firms in non-routine environments.

Another contribution is to propose foreignness as a criterion in imitation strategy. Existing imitation research has already shown that imitators identify benchmarkable exemplars based on imitation targets' salient

features, such as legitimate social traits, efficient performance and competitive advantage. Additionally, in this study we propose that foreign identity can make certain targets more vivid in a non-routine environment. Social proofing based on transnational benchmarks can complement endogenous mechanisms, such as cumulative experience and local networks, which tend to develop slowly based on local institutional logics, historical memory, or the discretion of the top management team.

A managerial implication for local imitators is that imitation can facilitate sense-making of new trends, such as eco-innovation adoption, especially if neighboring peers are converting eco-innovation opportunities into superior performance. However, as our findings show, imitation based on social proof lacks scientific assessment and may therefore not prove accurate, and may even blind a firm to opportunities to pursue creative path-breaking growth. Thus, firms should note the trade-offs of a frugal and speedy decision based on heuristics imitation. An implication for MNE managers concerns risk involving business partners' sustainability performance. MNEs often seek to harmonize environmental practices amongst business partners in the host country. Our study shows that profitable MNEs are more likely to successfully convince their partners over their environmental standards than other MNEs. Given imperfections in the imitation-by-learning process, it is furthermore necessary for MNEs to enhance proactive coordination and knowledge-sharing with local partners. Finally, policy-makers may consider green-growth opportunities by attracting foreign MNEs. FDI promotion packages may target foreign MNEs that have know-how in converting eco-innovation into profit, to stimulate local firms' interest in eco-innovation adoption. Given the disparity between imitation and learning, however, policy-makers may align FDI policies with eco-innovation-enhancement policies, such as policies facilitating transfer of best practices and cohesive networks towards the goal of increased eco-innovation within a national context.

Limitations and future research

A few limitations should be addressed in future research. First, this research is based on cross-sectional data and can involve endogeneity bias, reverse causality and common-method variance issues, despite the deployment of mitigating methods. Moreover, our data is based on firms in South Korea and may have limitations in generalizability. Thus, future research should use longitudinal data and consider the variation of the results depending on different national institutional contexts.

Furthermore, we propose the need for research into more-micro-foundations. Selection of social proof results from cognitive processes which are commonly linked to individual and micro-level decision-making, before

being materialized as the organizational macro-level decision. Furthermore, while this study focuses on the equity-based local operations of foreign MNEs, future studies could explore other types of MNE operations, such as international strategic alliances, licensing, franchising, exporting and importing.

Moreover, while we focused on the mode of interactions between imitators and targets, structural factors such as the establishment type of imitator (a big business or a small-and-medium sized firm) and corporate governance (centralized decision-making or not) may affect the perception of uncertainty; future research could well explore this effect.

Tables

TABLE 1 Industry distribution in KIS 2010

Industry	Number of firms	Ratio of MNE subsidiaries
Manufacture of food products	229	0.02
Manufacture of beverages	55	0.00
Manufacture of textiles, except apparel	178	0.00
Manufacture of wearing apparel, clothing accessories and fur articles	151	0.00
Manufacture of leather, luggage and footwear	90	0.01
Manufacture of wood and of products of wood and cork; except furniture	139	0.01
Manufacture of pulp, paper and paper products	167	0.03
Printing and reproduction of recorded media	148	0.00
Manufacture of coke, briquettes and refined petroleum products	43	0.02
Manufacture of chemicals and chemical products; except pharmaceuticals and medicinal chemicals	220	0.10
Manufacture of pharmaceuticals, medicinal chemical and botanical products	105	0.01
Manufacture of rubber and plastics products	229	0.04
Manufacture of other non-metallic mineral products	220	0.04
Manufacture of basic metals	208	0.02
Manufacture of fabricated metal products, except machinery and furniture	239	0.02
Manufacture of electronic components, computer; visual, sounding and communication equipment	214	0.06
Manufacture of medical, precision and optical instruments, watches and clocks	173	0.02
Manufacture of electrical equipment	229	0.04
Manufacture of other machinery and equipment	263	0.05
Manufacture of motor vehicles, trailers and semitrailers	220	0.10
Manufacture of other transport equipment	132	0.01
Manufacture of furniture	143	0.01
Other manufacturing	130	0.02
Total	3,925	0.03

Source: KIS 2010

TABLE 2 Variable specification

Variable	Measurement description	Data source
Eco-innovation (Eco-innov)	Log-transformed counts of environmental patent applications	KIPO
MNE_green	The ratio of MNEs with above-average eco-innovation scope in the industry's total R&D expenditures	KIS 2010
MNE_profit	The ratio of MNEs with above-average profit in the industry's total R&D expenditures	KIS 2010
MNE_size	The ratio of MNEs with above-average employment size in the industry's total R&D expenditures	KIS 2010
Imitate_green	Convergence of eco-innovation scopes between a local firm and the group of benchmarkable green MNEs	KIS 2010
Imitate_profit	Convergence of eco-innovation scopes between a local firm and the group of benchmarkable profitable MNEs	KIS 2010
Imitate_size	Convergence of eco-innovation scopes between a local firm and the group of benchmarkable sizeable MNEs	KIS 2010
Experience	The total environmental patent applications filed in 2004-2006	KIPO
Innovation network	A dummy variable based on the KIS survey question asking whether a firm has innovation collaborations with any business or institutional partners	KIS 2010
R&D intensity	R&D expenditures relative to sales	KIS 2010
Size	Log-transformed employment size	KIS 2010
Business group	Whether a firm cooperated with affiliates within the same business group for innovation	KIS 2010
Technology licensing	Log-transformed value of technological licensing fees	KIS 2010
Linkage	The ratio of transactions with industrial downstream customers in a firm's total sales	KIS 2010
Subsidy	Whether the firm has received any policy support for technological innovation	KIS 2010
Green taxes	The growth rate of total environment-related taxes levied in 2007-2009	Statistics Korea, Ministry of Environment
Competition	Herfinahl index in the industry	KIS 2010
Clockspeed	The five-point Likert scale (one for low, five for high)	KIS 2010
Other MNEs	The ratio of MNEs that do not conduct green innovation in the industry's total R&D expenditures	KIS 2010

TABLE 3 Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11
1	Eco-innov	1.000										
2	Imitate_green	0.013	1.000									
3	Imitate_profit	-0.071**	0.248***	1.000								
4	Imitate_size	0.018	0.315***	0.835***	1.000							
5	MNE_green	-0.011	0.120*	-0.196***	-0.235***	1.000						
6	MNE_profit	-0.041	0.139***	0.092***	0.105***	0.524***	1.000					
7	MNE_size	0.002	-0.080**	0.008	-0.133***	0.264***	-0.039	1.000				
8	Experience	0.639***	0.1042*	-0.020	-0.026	0.033	-0.020	0.023	1.000			
9	R&D intensity	-0.010	-0.097***	0.022	0.001	-0.020	-0.016	-0.006	-0.003	1.000		
10	Size	0.260***	0.110***	-0.071**	-0.031	0.058*	-0.076**	0.018	0.197***	-0.066**	1.000	
11	Innovation network	0.093*	0.053*	0.042	0.069**	-0.023	0.036	-0.060*	0.043	-0.024	0.095***	1.000
12	Business group	0.156***	0.023	-0.066**	-0.003	0.026	0.003	-0.011	0.167***	-0.004	0.254***	0.290***
13	Technology licensing	-0.007	-0.028	0.021	0.016	-0.012	-0.037	0.032	0.001	-0.021	0.011	-0.030
14	Linkage	0.024	0.050	-0.050	0.032	0.047	-0.094***	-0.016	0.010	-0.037	0.168***	0.072**
15	Green tax	-0.073**	-0.013	0.085**	0.026	-0.020	-0.029	0.026	-0.042	-0.017	0.025	-0.020
16	Subsidy	0.118***	0.083***	-0.035	0.026	0.047	0.028	0.003	0.042	-0.037	0.165*	0.204*
17	Competition	-0.010	0.016	-0.022	-0.042	-0.026	0.056*	-0.076**	0.031	-0.007	-0.019	0.044

18	Clockspeed	-0.056*	0.025	-0.079**	-0.147***	0.061*	0.005	-0.034	-0.023	0.020	-0.017	-0.041
19	Other MNEs	0.014	0.020	0.218***	0.301***	-0.081***	0.103***	-0.058*	-0.021	-0.002	-0.004	0.001
Observations		1036	989	903	1036	1036	1036	1036	1036	1036	1036	1036
Mean		0.075	-2.399	-1.038	-1.410	0.110	0.054	0.009	0.961	34208	4.306	0.264
Standard deviation		0.404	1.832	0.722	1.282	0.264	0.157	0.084	17.582	670028	1.381	0.441

		12	13	14	15	16	17	18	19
12	Business group	1.000							
13	Technology licensing	-0.016	1.000						
14	Linkage	0.115***	-0.003	1.000					
15	Green tax	-0.018	0.017	0.115***	1.000				
16	Subsidy	0.084***	-0.015	0.045	-0.021	1.000			
17	Competition	0.033	0.008	-0.021	0.009	0.000	1.000		
18	Clockspeed	-0.057*	0.033	0.046	-0.056*	-0.076**	0.020	1.000	
19	Other MNEs	0.008	0.042	0.001	0.013	-0.003	0.012	-0.001	1.000
Observations		1036	1036	1036	1036	1036	1036	1036	1036
Mean		0.032	0.136	0.373	-0.350	0.624	0.366	2.689	0.032
Standard deviation		0.176	0.337	0.449	0.473	0.485	0.250	0.745	0.047

Note: *** p<0.01, ** p<0.05, * p<0.1

TABLE 4 Empirical Results (1)

Dependent variables	(1) H1a Imitate _green	(2) H1b Imitate _profit	(3) H1c Imitate _size	(4) H2a, 2b Eco-innov	(5) H2a, 2b Eco-innov	(6) H2a, 2b Eco-innov
Key IVs						
MNE_green	2.257			0.050		
	(1.608)			(0.156)		
MNE_profit		3.756***			0.435	
		(0.900)			(0.298)	
MNE_size			-20.84***			0.330
			(2.598)			(0.552)
Imitate_green				-0.012*		
				(0.006)		
Imitate_profit					-0.052***	
					(0.011)	
Imitate_size						-0.005
						(0.011)
Other IVs						
Experience	-0.001	0.002**	0.004***	0.014***	0.014***	0.014***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Innovation network	0.241**	0.084*	0.161*	0.041	0.046	0.037
	(0.104)	(0.049)	(0.082)	(0.026)	(0.028)	(0.025)
Controls – Firm level						
R&D intensity	-1.86e-07***	2.27e-08***	2.28e-08	-1.58e-09	2.43e-09	1.35e-10
	(3.82e-08)	(6.93e-09)	(1.57e-08)	(2.44e-09)	(2.84e-09)	(2.18e-09)
Size	0.129	0.006	-0.027	0.037***	0.042**	0.035**
	(0.082)	(0.019)	(0.036)	(0.014)	(0.016)	(0.014)
Business group	-0.071	-0.380**	-0.182	0.004	-0.005	0.005
	(0.387)	(0.157)	(0.173)	(0.122)	(0.134)	(0.122)
Technology licensing	-0.192	-0.030	-0.022	0.002	3.28e-05	0.004
	(0.244)	(0.059)	(0.081)	(0.023)	(0.034)	(0.024)
Linkage	0.073	0.022	-0.042	-0.003	-0.001	-0.001
	(0.143)	(0.047)	(0.082)	(0.027)	(0.029)	(0.027)
Subsidy	0.251**	0.023	0.125*	0.052***	0.048***	0.047***
	(0.109)	(0.045)	(0.064)	(0.012)	(0.014)	(0.013)
Controls – Industry level						
Green taxes	0.076	0.115	-0.017	-0.053*	-0.050	-0.051*
	(0.116)	(0.072)	(0.099)	(0.030)	(0.035)	(0.029)
Competition	-0.546	-0.486*	-0.786*	-0.052	-0.092**	-0.040
	(0.711)	(0.242)	(0.466)	(0.037)	(0.037)	(0.036)
Clockspeed	-0.031	-0.033	-0.143**	-0.017	-0.026**	-0.015
	(0.067)	(0.031)	(0.054)	(0.013)	(0.012)	(0.013)
Other MNEs	0.250	-1.565	1.637	0.344	0.143	0.363
	(3.421)	(1.018)	(1.077)	(0.327)	(0.262)	(0.350)
Selection				-0.010**	-0.012**	-0.006
				(0.005)	(0.005)	(0.005)
Constant	-3.211***	-0.451**	-0.373	-0.122	-0.085	-0.118
	(0.667)	(0.212)	(0.393)	(0.077)	(0.079)	(0.073)

Observations	989	903	1,036	989	903	1,036
R^2	0.160	0.289	0.389	0.449	0.460	0.447
Region	Included	Included	Included	Included	Included	Included
Industry	Included	Included	Included	Included	Included	Included

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 5 Empirical Results (2)

	(7) H3a	(8) H3b	(9) H4a	(10) H4b
Dependent variables	Imitate_profit	Eco-innov	Imitate_profit	Eco-innov
Key IVs				
MNE_profit	3.794***	0.312	4.037***	0.411
	(0.906)	(0.231)	(0.937)	(0.290)
Imitate_profit		-0.037**		-0.030**
		(0.014)		(0.012)
Interactions				
MNE_profit x Experience	-0.057***			
	(0.017)			
Imitate_profit x Experience		-0.056*		
		(0.030)		
MNE_profit x Innovation network			-1.000	
			(0.694)	
Imitate_profit x Innovation network				-0.081**
				(0.039)
Other IVs				
Experience	0.002***	-0.060	0.002**	0.014***
	(0.001)	(0.040)	(0.001)	(0.002)
Innovation network	0.084*	0.049*	0.133*	-0.033
	(0.049)	(0.027)	(0.074)	(0.042)
Controls – Firm level				
R&D intensity	2.30e-08***	2.55e-09	2.34e-08***	1.80e-09
	(6.90e-09)	(2.74e-09)	(6.89e-09)	(2.75e-09)
Size	0.007	0.045**	0.006	0.042**
	(0.019)	(0.016)	(0.020)	(0.016)
Business group	-0.353**	-0.061	-0.379**	-0.026
	(0.160)	(0.092)	(0.156)	(0.134)
Technology licensing	-0.031	0.012	-0.033	-0.003
	(0.059)	(0.041)	(0.060)	(0.034)
Linkage	0.024	-0.006	0.023	-0.001
	(0.047)	(0.027)	(0.046)	(0.029)
Subsidy	0.023	0.051***	0.027	0.049***
	(0.045)	(0.014)	(0.046)	(0.014)
Controls – Industry level				
Green taxes	0.111	-0.053	0.116	-0.048
	(0.073)	(0.034)	(0.073)	(0.035)
Competition	-0.484*	-0.092**	-0.486*	-0.092**
	(0.241)	(0.038)	(0.241)	(0.036)
Clockspeed	-0.034	-0.024*	-0.032	-0.024*
	(0.031)	(0.012)	(0.031)	(0.054)
Other MNEs	-1.539	0.148	-1.533	0.146
	(1.018)	(0.252)	(1.016)	(0.256)
Selection		-0.010**		-0.012**
		(0.004)		(0.004)
Constant	-0.451**	-0.087	-0.465**	-0.070
	(0.212)	(0.081)	(0.209)	(0.076)

Observations	903	903	903	903
R^2	0.291	0.487	0.291	0.463
Region	Included	Included	Included	Included
Industry	Included	Included	Included	Included

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Figures

FIG. 1 Conceptual model

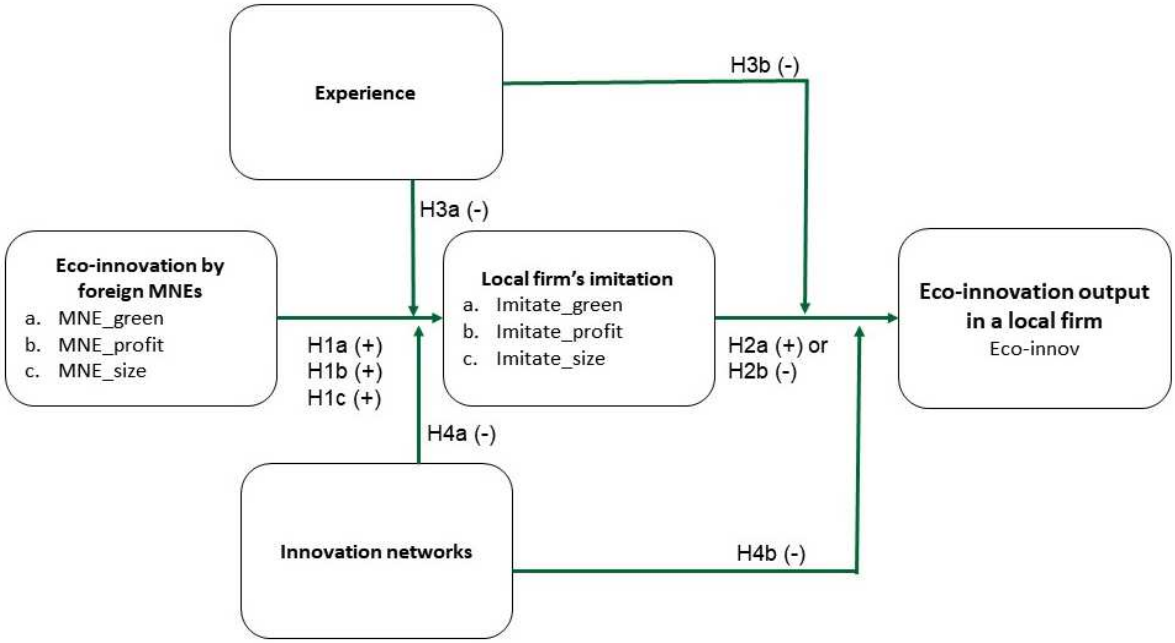
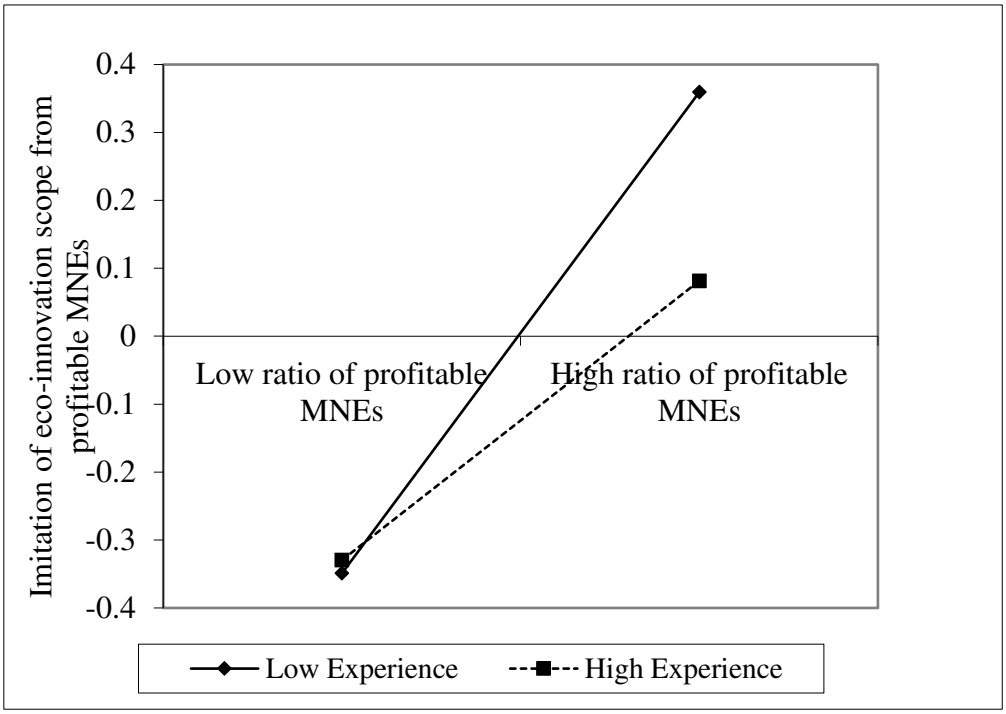


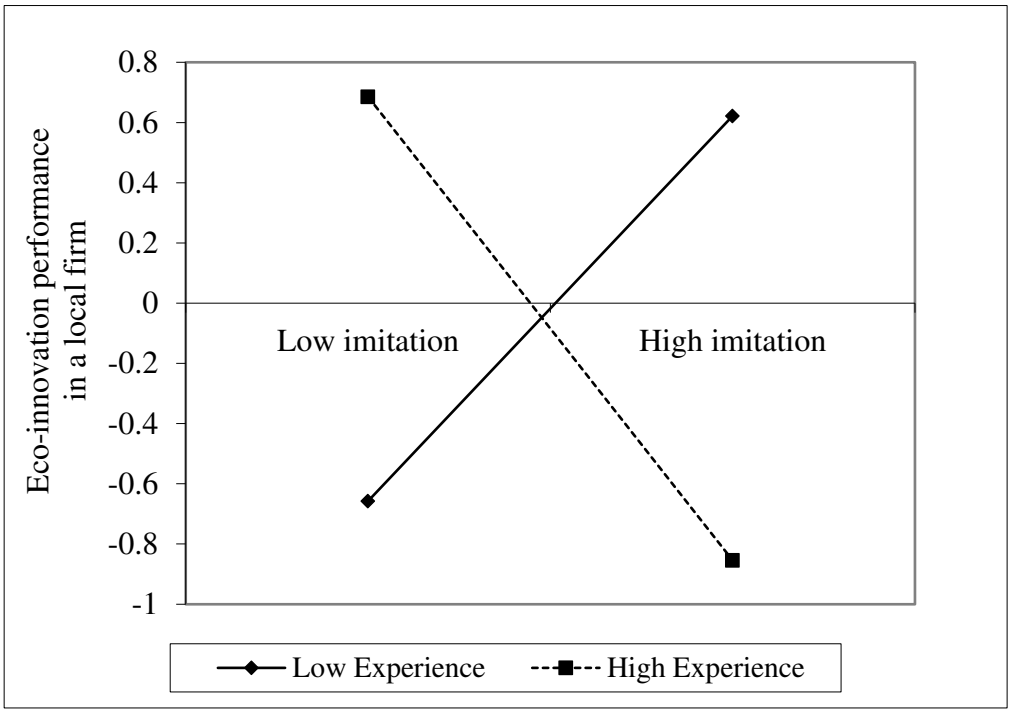
FIG. 2 Moderating effects of past experience

a. The ratio of profitable MNEs and degree of a local firm's imitation (H3a)



Note: Low Experience is defined as one standard deviation below the mean score; High Experience is one standard deviation above the mean.

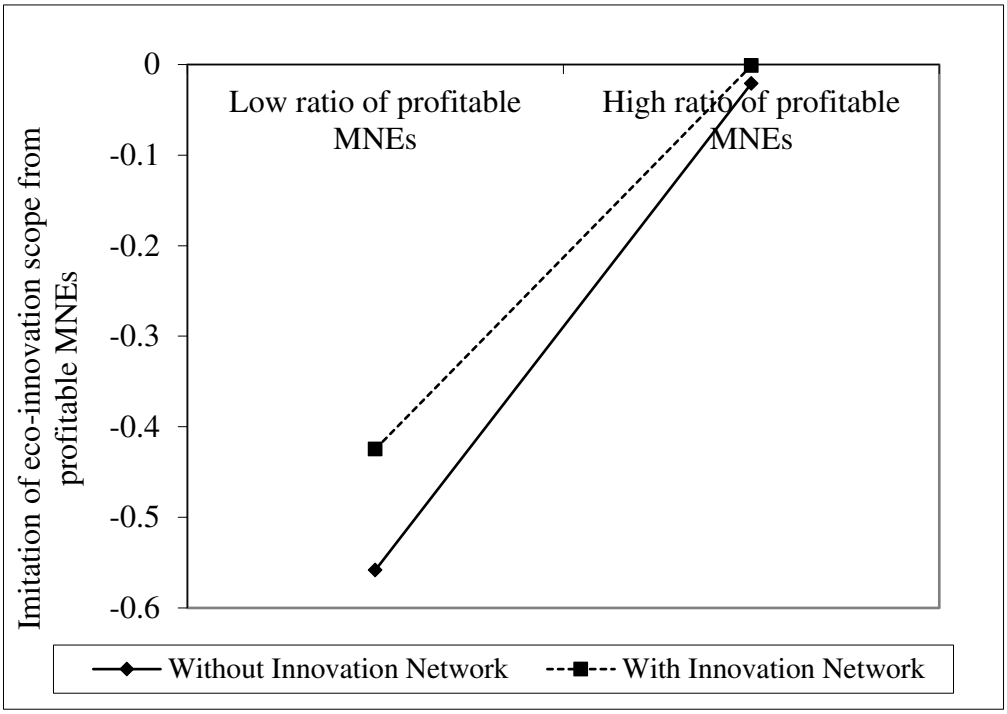
b. Imitation of profitable MNEs and a local firm's eco-innovation performance (H3b)



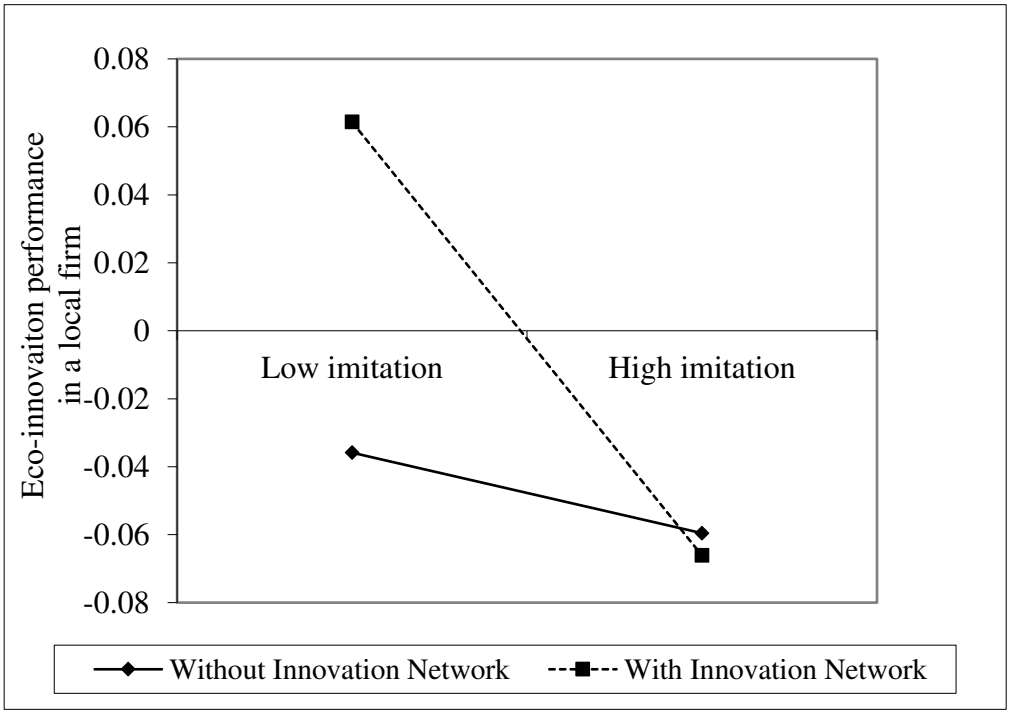
Note: Low Experience is defined as one standard deviation below the mean score; High Experience is one standard deviation above the mean.

FIG. 3 Moderating effects of innovation network

a. The ratio of profitable MNEs and degree of a local firm's imitation (H4a)



b. Imitation of profitable MNEs and a local firm's eco-innovation performance (H4b)



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