Journal of International Business Studies (2019)

www.jibs.net

RESEARCH NOTE

Global connectedness and dynamic green capabilities in MNEs

Vladislav Maksimov[1], Stephanie Lu Wang[2] and Shipeng Yan[3]

[1] *Department of Management, Bryan School of Business and Economics, University of North Carolina at Greensboro, Greensboro, NC 27402-6170, USA;* [2] *Kelley School of Business, Indiana University, Bloomington, IN 47405, USA;* [3] *Department of Management, City University of Hong Kong, Kowloon, Hong Kong*

Correspondence:
V Maksimov, Department of Management, Bryan School of Business and Economics, University of North Carolina at Greensboro, Greensboro, NC 27402-6170, USA.
Tel: 1-336-334-3424;
e-mail: vrmaksim@uncg.edu

Abstract
We study how global connectedness can help MNEs become more environmentally sustainable. Based on the idea that environmental sustainability requires dynamic capabilities, we define dynamic green capability as the ability to build complementary green competences and reconfigure organizationally embedded resources to pursue competitive advantage in a rapidly changing stakeholder environment. We argue that MNEs with greater global connectedness in terms of international diversification or international environmental certification possess knowledge advantages in cultivating dynamic green capabilities. We extend the sensing–seizing–reconfiguring framework and propose that global connectedness substitutes for sensing as a driver of seizing by providing direct access to relevant green knowledge pools around the world, and that it complements seizing as a driver of reconfiguring by strengthening the knowledge routines needed to integrate green competences.
Journal of International Business Studies (2019).
https://doi.org/10.1057/s41267-019-00275-z

Keywords: environmental sustainability; MNEs; dynamic capabilities; global connectedness; knowledge-based view

INTRODUCTION

More than any other business organizations, multinational enterprises (MNEs) face a dynamic and complex stakeholder environment when managing environmental sustainability. MNEs are exposed to growing pressures from a variety of stakeholders around the world (Buysse & Verbeke, 2003; Kassinis & Vafeas, 2006). They are also subject to higher scrutiny by media (Burchell & Cook, 2013; Kolk, 2010), skepticism in host communities (Mithani, 2017), and possible spillover effects across affiliates (Rugman & Verbeke, 2001; Wang & Li, 2019). Moreover, rapid and potentially disruptive changes in climate, technology, and society create urgency about sustainable development for many stakeholder groups (Bansal, 2019), further accelerating the pace of change of their environmental expectations from MNEs. These circumstances are expected to increase MNEs' motivation to pursue environmental sustainability and achieve competitive advantages (Buysse & Verbeke, 2003). Scholars suggest that MNEs require dynamic capabilities to reconfigure their resource base successfully and to maintain fit with the stakeholder environment (Kolk & Pinkse, 2008). In this study,

Electronic supplementary material The online version of this article (https://doi.org/10.1057/s41267-019-00275-z) contains supplementary material, which is available to authorized users.

Vladislav Maksimov, Stephanie Lu Wang, and Shipeng Yan have contributed equally to this work.

Received: 7 January 2018
Revised: 17 July 2019
Accepted: 27 August 2019

we examine how global connectedness helps MNEs cultivate dynamic capabilities to manage environmental sustainability.

Cultivating such dynamic capabilities reflects a commitment to proactive environmental strategies, whereby firms build green capabilities beyond compliance with government regulation (Rugman & Verbeke, 1998a, 1998b; Gonzalez-Benito & Gonzalez-Benito, 2006). Improvements in environmental sustainability require the successful orchestration of two key competence-related functions. First, the development of green capabilities is path-dependent, requiring complementary investments in various competences (Rugman & Verbeke, 1998a; Hart & Dowell, 2011). Second, the needed resources and competences are organizationally embedded, which points to the importance of managing their coevolution and the associated tacit knowledge (Aragón-Correa & Sharma, 2003; Buysse & Verbeke, 2003). Considering these unique features of the dynamic capabilities needed to manage environmental sustainability, we define dynamic green capability as the ability to build complementary green competences and reconfigure organizationally embedded resources to pursue competitive advantage in a rapidly changing stakeholder environment.

Dynamic green capabilities pose two key knowledge requirements for firms. One is that they must connect with stakeholders and acquire relevant knowledge about threats and opportunities. The other is that they must establish the organizational systems needed to build and integrate green competences into the organizational core. According to the sensing–seizing–reconfiguring framework (Helfat & Peteraf, 2015; Teece, 2007), sensing and seizing are the two key mechanisms for achieving the needed knowledge acquisition and integration, and ultimately for reconfiguring knowledge and achieving competitive advantage. This might explain why some MNEs that fail to meet these knowledge requirements have been criticized for their reactive rather than proactive approaches to environmental sustainability (Li & Zhou, 2017) or their seemingly irresponsible "greenwashing" practices (Banerjee, 2008) despite strong stakeholder pressures and expected high motivation to be greener. Yet existing scholarship is limited in the extent to which it addresses how MNEs can meet these knowledge requirements and cultivate dynamic green capabilities.

Our key argument is that MNEs with greater global connectedness possess knowledge advantages regarding the cultivation of dynamic green capabilities. Global connectedness helps MNEs access a greater variety of stakeholders and knowledge (Rugman & Verbeke, 2001; Van Zanten & Van Tulder, 2018) and build greater organizational capabilities for integrating new knowledge (Cano-Kollmann, Cantwell, Hannigan, Mudambi, & Song, 2016; Scalera, Perri, & Hannigan, 2018). We examine two aspects of global connectedness. One is international diversification, the extent to which the MNE connects to the stakeholder environment through its geographically dispersed affiliates. The other is international environmental certification, such as from the International Organization for Standardization (ISO) 14000, which links the MNE to a common international body of knowledge on environmental sustainability. We suggest that global connectedness substitutes for sensing as a driver of seizing because it provides direct access to relevant knowledge pools around the world, but it complements seizing as a driver of reconfiguring because it helps MNEs improve their ability to integrate green competences with other organizational competences. Both global connections have been discussed in the context of environmental sustainability in MNEs (e.g., Kang, 2013; Rugman & Verbeke, 1998b; Strike, Gao, & Bansal, 2006), but their knowledge implications for cultivating dynamic green capabilities have not been explicitly examined.

Empirically, we recognize that sensing, seizing, and reconfiguring are difficult to capture because each represents an orchestration capacity involving complex processes (Teece, 2007). For this reason, we identify several key indicators of sensing, seizing, and reconfiguring. We provide three separate sets of consistent results. One is reported in the main body of the paper, and the other two are provided in the supplementary file.

THEORETICAL FRAMEWORK

Dynamic Green Capability

Combining insights from the dynamic capabilities literature (Luo, 2000; Teece, Pisano, & Shuen, 1997) and the environmental sustainability literature (Aragón-Correa & Sharma, 2003; Buysse & Verbeke, 2003; Rugman & Verbeke, 1998a), we define dynamic green capability as the ability to build complementary green competences and reconfigure organizationally embedded resources to pursue competitive advantage in a rapidly changing

stakeholder environment. This definition underscores the four unique features of dynamic capabilities needed to improve environmental sustainability.

First, building complementary green competences recognizes the path dependence in associated competence investments (Florida, 1996; Rugman & Verbeke, 1998a). Path dependence refers to the idiosyncratic sequence of resource accumulation along different but interdependent resource domains (Aragón-Correa & Sharma, 2003; Hart & Dowell, 2011; Teece et al., 1997). For example, green improvements may require investment not only in green technologies but also in environmental employee training, organizational competences (R&D, production, marketing, etc.), formal management systems, and strategic planning (Buysse & Verbeke, 2003).

Second, the need to reconfigure organizationally embedded resources acknowledges the required co-evolution of green and other competences (Hart & Dowell, 2011), as well as the tacit knowledge involved in the process (Aragón-Correa & Sharma, 2003). Managing such co-evolution is firm-specific and requires a deep understanding of competence and process interdependencies and complementarities (Kolk & Pinkse, 2008; Luo, 2000).

Third, the pursuit of competitive advantage reflects a motivation for proactive environmental strategy (Gonzalez-Benito & Gonzalez-Benito, 2006). Evidence suggests that despite growing stakeholder pressures, many companies tend to be cautious about making substantial green investments along various resource domains (Buysse & Verbeke, 2003). Among MNEs, "avoiding harm" often prevails over "doing good" (Van Zanten & Van Tulder, 2018). A motivation for social responsibility may fall short in the absence of corresponding capabilities (Campbell, Eden, & Miller, 2012; Strike et al., 2006). Therefore, building green competences and reconfiguring the required resources are necessary to generate competitive advantages (Bansal & Roth, 2000; Hoffman, 2001; Porter & van der Linde, 1995).

Fourth, the emphasis on the stakeholder environment highlights the plural nature of environmental sustainability and the complex dynamics that managers are likely to encounter (Margolis & Walsh, 2003). In addition to changing regulations and rising consumer expectations (Kolk & Pinkse, 2008), managers must account for local community pressures and co-evolution (Kassinis & Vafeas, 2006; Mithani, 2017), coopetition in industry dynamics, where rivalry for advantage may be combined with a need for the collective construction of green practices (Jones, York, Vedula, Conger, & Lenox, 2019), building and retaining the requisite human capital (Ramus & Steger, 2000), and growing challenges from climate change (Huang, Kerstein, & Wang, 2018). Moreover, this emphasis implies a long-term vision (Kang, 2013) because of the necessity of meeting the needs of present generations without compromising those of future generations (Bansal, 2019).

This definition of dynamic green capabilities has unique implications for MNEs. Because MNEs face a broad and diverse field of stakeholders, pressure for environmental sustainability should provoke a greater motivation to respond. In turn, MNEs need to find effective solutions to the orchestration challenges of path-dependence and co-evolution in green competence development. As we explain later, because of the knowledge requirements for managing such external and internal environments, MNEs that build knowledge advantages can cultivate dynamic green capabilities more effectively.

Sensing, Seizing, and Reconfiguring Green Knowledge

Our definition of dynamic green capability corresponds to the reconfiguring portion of the sensing–seizing–reconfiguring framework (Helfat & Peteraf, 2015; Teece, 2007, 2014). Following the logic prescribed by Teece (2007), reconfiguring requires that organizations first sense and then seize opportunities. The key role of sensing is to connect the organization to its environment to keep track of changes and build awareness of potential opportunities and threats, while the main role of seizing is to mobilize organizational resources by establishing formal policies and systems (Teece, 2007). Therefore, to cultivate dynamic green capabilities, managers must sense their stakeholder environment and build a formal organizational infrastructure that promotes the development of green competences through path dependence and co-evolution.

The sensing and seizing functions place specific knowledge mandates on firms. The ability to acquire and integrate knowledge, both internally and externally, is essential to performing sensing, seizing, and reconfiguring, especially in networked organizations, such as the MNE (Teece, 2007). Indeed, knowledge is critical to the cultivation of dynamic capabilities (Nonaka, 1994; Zollo & Winter, 2002), and managers must perform various

knowledge functions such as acquisition, sharing, and integration (Luo, 2000; Verona & Ravasi, 2003). To be effective at sensing green opportunities and threats, MNEs need to access and acquire knowledge from their stakeholder environment. At a minimum, they need to be aware of environmental regulations in different countries and their trends (Rugman & Verbeke, 1998b), expected customer, supplier, and competitor responses (Campbell et al., 2012; Porter & van der Linde, 1995), and needed technologies, along with their evolution and complementarity with others (Arora & Cason, 1996; Shrivastava, 1995). Because of the high importance attached to environmental sustainability issues and the urgency they pose, gathering knowledge from stakeholders and awareness of opportunities and threats are strong triggers for MNEs to act by modifying policies (Huang et al., 2018) or adjusting investments (Mithani, 2017). Assessing the implications from such knowledge is also likely to modify the strategic planning process (Buysse & Verbeke, 2003), which is typically reflected in annual reporting.

Further, to be effective at seizing green opportunities, MNEs need to disseminate, share, and integrate the knowledge needed for the development of green competences. This requirement corresponds to Rugman & Verbeke's (1998a, 1998b) notion of integrating green and other competences. By establishing policies, systems, and structures (Luo, 2000), MNEs can modify existing routines by adding, deleting, or interpreting knowledge differently (Zahra & George, 2002). Routine adjustment is needed to generate complementarities and orchestrate the co-evolution of required green resources and competences (Hart & Dowell, 2011; Kolk & Pinkse, 2008). Therefore, to achieve greater reconfiguring of resources for improved environmental sustainability, MNEs need strong knowledge integration routines (Florida, 1996; Verona & Ravasi, 2003). Applying the framework to dynamic green capabilities, the baseline argument is that *sensing green opportunities in one period is positively associated with seizing green opportunities in the next period, which is positively associated with reconfiguring green resources in the following period.*

The Moderating Effect of Global Connectedness

Global connectedness to stakeholders affects the knowledge tasks associated with sensing and seizing that are necessary to cultivate dynamic green capabilities. Because of the plural nature of environmental sustainability, building connections with various stakeholders is deemed important for acquiring relevant knowledge on a wider variety of environmental sustainability issues and accessing the complementary knowledge needed to enhance environmental sustainability practices (Van Zanten & Van Tulder, 2018). Greater global connectedness can thus reduce the uncertainty of managing a dynamic and complex stakeholder environment. Furthermore, by building more internal and external linkages to access, disseminate, and share knowledge, MNEs can build stronger knowledge routines for integrating new knowledge (Cantwell & Santangelo, 1999; Scalera et al., 2018). A key insight from the literature on innovation in MNEs is that connecting to pockets of complementary knowledge around the world reinforces the learning processes associated with knowledge sharing and integration (Berry, 2014; Cano-Kollmann et al., 2016). Applying this idea to dynamic green capabilities suggests that global connectedness strengthens the ability of MNEs to establish the effective formal systems needed to reconfigure path-dependent and organizationally embedded resources.

A direct way to develop global connections is to establish subsidiaries in foreign countries. MNEs place subsidiaries strategically to tap into the diverse pockets of knowledge needed to improve their existing capabilities (Scalera et al., 2018). Because firms and locations tend to co-evolve through knowledge exchange (Cano-Kollmann et al., 2016), MNEs ultimately develop networks of locally embedded affiliates that interact closely, not only with local firms (Turkina & Van Assche, 2018) but also with other stakeholders (Kolk & Fortanier, 2013; Kostova & Zaheer, 1999). It is also possible for MNEs to build global connections indirectly by adopting global standards. For example, the ISO 14000 is a public–private sector initiative to remedy problems of disparate environmental standards by developing voluntary international environmental management standards for business (Benson, 1996). Beginning with the regulation of national governments and international organizations such as the Organisation for Economic Co-operation and Development (OECD), ISO 14000 was developed by the International Organization for Standardization, which has over 50 member-states. By adopting ISO 14000, MNEs can connect to a pool of knowledge on environmental sustainability that is mutually agreed upon by a wide variety of stakeholders around the world.

International diversification

The first aspect of global connectedness that we examine is international diversification. International diversification reflects an MNE's expansion of the sale of goods and services across different countries (Hitt, Hoskisson, & Kim, 1997). Because international diversification occurs through the deployment of existing resources in new geographic locations, where new knowledge is created and then transferred and combined with other knowledge (Berry, 2014; Luo, 2000; Rugman & Verbeke, 2003), more diversified MNEs build stronger routines for accessing, sharing, and integrating knowledge (Cantwell & Santangelo, 1999; Scalera et al., 2018). Thus, we expect that international diversification will affect the relationships between sensing, seizing, and reconfiguring in the cultivation of dynamic green capabilities. This idea moves beyond findings in prior research that indicate a direct positive relationship between international diversification and proactive environmental strategies (Buysse & Verbeke, 2003) or various sustainability initiatives (Attig, Boubakri, El Ghoul, & Guedhami, 2016; Kang, 2013; Van Zanten & Van Tulder, 2018).

International diversification helps MNEs cultivate dynamic green capabilities by substituting for sensing in enabling greater seizing of green opportunities. By connecting to a wider variety of stakeholders around the world, more diversified MNEs have more opportunities to learn about a diverse set of environmental sustainability issues (Van Zanten & Van Tulder, 2018). Some issues that are more locally pronounced are also globally interconnected with others (Kolk & Pinkse, 2008), and hence encountering them helps MNEs build greater awareness and identify more green opportunities and potential threats. MNEs utilize such opportunities strategically to fine-tune their investments and management policies (Huang et al., 2018; Mithani, 2017) that are needed for seizing. Thus, by providing an alternative route to connect to more stakeholders around the world, international diversification assumes the same function as that of sensing in driving greater seizing. Further, more diversified MNEs are more likely to rely on the advantages provided by comparing experiences across locations in identifying opportunities to close green competence gaps (Kang, 2013) and tracking environmental sustainability trends (Brammer, Pavelin, & Porter, 2009). MNEs can also tap into locally embedded pockets of knowledge in host countries and learn from the best practices of others for more sustainable solutions (Christmann, 2000) and can participate in the collective construction of such practices (Jones et al., 2019). As a result, greater international diversification helps MNEs seize green opportunities directly, which reduces the need to rely on sensing to stimulate the mobilization of resources to capture these opportunities. Therefore, we propose:

> **Hypothesis 1:** International diversification in MNEs negatively moderates the relationship between sensing and seizing green opportunities.

Furthermore, international diversification helps MNEs cultivate dynamic green capabilities by complementing seizing efforts to spur greater reconfiguring of needed resources. Through greater connectedness with a more diverse set of stakeholders worldwide, more diversified MNEs build greater knowledge connectedness across distinct locations, allowing them to integrate new knowledge with existing knowledge resources within the firm (Scalera et al., 2018). MNEs thus become better at structuring knowledge functions involving strong tacit components (Cantwell & Santangelo, 1999). Diversified MNEs can further strengthen these knowledge routines by experimenting with new and alternative investments across the multinational network (Teece, 2014). The knowledge advantages provided by diversification allow MNEs to build more effective environmental management systems with which to orchestrate the coevolution of path-dependent green competences. For example, they can utilize cross-subsidiary linkages to more effectively enrich environmental technologies while also funneling relevant knowledge from different parts of the network to improve environmental production capabilities in their supply chain (Turkina & Van Assche, 2018). Overall, more diversified MNEs are more skillful at mobilizing resources globally to manage the complex dynamics of aligning internal green competence development with changes in the stakeholder environment. Thus, we propose the following:

> **Hypothesis 2:** International diversification in MNEs positively moderates the relationship between seizing and reconfiguring green resources.

International environmental certification

The second aspect of global connectedness that we examine is international environmental certification. Obtaining international environmental

certification directly increases MNEs' connection to internationally agreed-upon environmental sustainability standards. For example, the ISO 14000 family of standards provides firms with practical knowledge and tools to manage their environmental responsibilities (ISO, 2015). This certification is voluntary and maps out a proven framework that MNEs can follow to set up an effective environmental management system. During the process, MNEs can gain access to updated knowledge and practices to enhance eco-efficiency, improve green products, and establish a presence in green markets. Because of this access to relevant environmental sustainability knowledge, adopting ISO 14000 will affect the relationships between sensing, seizing, and reconfiguring. Whereas past research focuses on the direct relationship between international environmental certification and proactive environmental strategies (Christmann, 2000; Rugman & Verbeke, 1998b), our discussion moves further by examining the role of such voluntary certification in cultivating a dynamic green capability.

Obtaining international environmental certification substitutes for sensing in the relationship between sensing and seizing green opportunities. An overarching function of international environmental certification is to serve as an interactive learning platform to holistically diffuse standards and best practices in environmentally responsible management (Christmann, 2000). Hence, environmental management becomes easier to integrate with strategic planning functions as managers learn to incorporate environmental issues into other administrative functions. Further, ISO 14000 provides direct guidance with needed resource investments such as employee education and training (King, Lenox, & Terlaak, 2005), directly promoting greater seizing. For example, ISO 14001 requires each certified firm to disclose its environmental policy, so responsible corporate environmental management is institutionalized within the organization (Bansal & Bogner, 2002). It also enables managers to gain access to knowledge relevant to improving formal management systems needed to mobilize various resources (Rugman & Verbeke, 1998b). Thus, MNEs adopting ISO 14000 can use such externally derived knowledge to establish policies that facilitate their efforts to seize green opportunities. By providing an alternative route to identify and pursue green opportunities, obtaining international environmental certification subsumes the role of sensing in driving greater seizing of these green opportunities. In contrast, for MNEs without such international environmental certification, the need to rely on sensing in identifying green opportunities becomes greater. Thus, we propose the following:

Hypothesis 3: International environmental certification in MNEs negatively moderates the relationship between sensing and seizing green opportunities.

Furthermore, adopting a voluntary international environmental standard can complement efforts to mobilize resources through seizing by guiding the process of accumulating needed green competences. As the focal point of information exchange by multiple stakeholders, an international environmental standard provides a pool of knowledge that can be used to meet stakeholder expectations, at least in part (Christmann & Taylor, 2001), and it can thus reduce uncertainty from changes in the stakeholder environment. Managers of MNEs can learn about effective management practices in various areas, such as redesigning production processes to reduce pollution, recycling by-products, or using alternative materials (Husted, Montiel, & Christmann, 2016; Rasche, Waddock, & McIntosh, 2013). Moreover, the process of certification offers a platform for internal learning, whereby MNEs interact with external knowledge and can identify idiosyncratic resource interdependencies, competence gaps, possible organizational tensions, and solutions (Christmann, 2000). The resulting improvements in the effectiveness of formal environmental management systems are further augmented during certification accreditation in third-party audits (ISO, 2015). Through this internalization of knowledge, managers can devise more efficient policies and systems to resolve critical resource reconfiguration issues (Helfat & Peteraf, 2015). Additionally, international environmental certification provides a platform for interaction with various stakeholders around the world. By using their certification strategically, MNEs can improve their reputation and other relational resources (King et al., 2005) to more easily coordinate the co-evolution of needed green competences throughout the network. Hence, obtaining international environmental certification provides considerable knowledge advantages that complement MNEs' policies for capturing opportunities for green improvements. As a result, MNEs with such

certification can improve the effectiveness of their existing environmental policies. Thus, we propose the following:

Hypothesis 4: International environmental certification in MNEs positively moderates the relationship between seizing and reconfiguring green resources.

METHODS

Data Source and Sample

We summarize the detailed data sources and measures of the variables in Table 1. Our firm-level data primarily come from Datastream and Thomson Reuters ASSET4. ASSET4 is a specialty provider on objective, auditable, and systematic environmental, social, and governance data at the firm level. Covering 61 countries, this database provides data through multi-step verification and process control by trained research analysts. The research analysts examine objective and publicly available primary data from stock exchange filings, corporate social responsibility and annual reports, civil society reports, and news sources and then provide evaluations that are transformed into standardized Z-scores to enable quantitative analysis across time, countries, and firms. Our country-level variables come from multiple sources, including the World

Table 1 Variables, measures, and data sources.

Variable	Measure	Data source
Sensing	ENERO22S: the degree to which the company is aware that climate change can present commercial risks and/or opportunities	ASSET4
Seizing	ENERD01S: the degree to which a firm has a policy for reducing environmental emissions or its impact on biodiversity or has a policy on maintaining an environmental management system ENPID01S: the degree to which a firm has a policy on environmental product innovation ENRRD01S: the degree to which a firm has a policy on reducing the use of natural resources	ASSET4
Reconfiguring	ENPIO01S: is at least one product line or service designed to have positive effects on the environment or that is environmentally labeled and marketed? Product Impact Minimization (ENPIO16S): Are there take-back procedures and recycling programs to reduce the potential risks of products entering the environment? OR are there product features and applications or services that will promote responsible, efficient, cost-effective and environmentally preferable use? Eco-Design Products (ENPIO13S): Are there specific products designed for reuse, recycling, or the reduction of environmental impacts?	ASSET4
International diversification	The extent to which a firm's sales are diverse across different countries (1-year lag)	Datastream
International environmental certification	Whether a focal firm participates in the ISO 14000 standard	ASSET4
Assets	Logged amount of assets (1-year lag)	Datastream
Price-to-book	Market capitalization over book value (logged, 1-year lag)	Datastream
Return on equity	Pretax profit over equity (1-year lag)	Datastream
Leverage ratio	Total liabilities over total equity (1-year lag).	Datastream
Product diversification	The extent to which the firm's sales are diverse across product segments (1-year lag)	Datastream
Sales	Logged amount of sales (1-year lag)	Datastream
Trade openness	(Import + exports)/GDP (1-year lag)	The World Bank
Financial development	A composite index of how good access to finance is for firms (1-year lag)	IMF
Education	Number of years of schooling before tertiary education	The World Bank
Patents/10,000	The number of patent applications filed in a country (1-year lag)	World IP database
Pro-market institution	The extent to which a firm's host country has strong pro-market institutions (1-year lag)	The Heritage Foundation
Environment policy stringency	The extent to which a firm's host country has stringent environmental policies	OECD

Bank and the International Monetary Fund (Sviridzenka, 2016). To ensure that our sample contains exclusively MNEs, we include only observations whose sales from foreign subsidiaries are greater than zero. After dropping observations with missing values for our variables of interest, we obtain a final sample of 2937 MNEs from 30 home countries between 2002 and 2013. Table 2 presents the details of the sample distribution across the 30 countries.

Variables and Measures

Recognizing the difficulties in using objective data to measure sensing, seizing, and reconfiguring, we develop three sets of measures. The consistency of the results between the three sets of alternative measures strongly supports our arguments. We report the results from one set of measures here and the other two in the *supplementary file*.

Table 2 Firm-year observations by country.

#	Country name	Frequency	Percent
1	Australia	1192	5.73
2	Austria	162	0.78
3	Belgium	195	0.94
4	Canada	1188	5.71
5	China	258	1.24
6	Czech Republic	13	0.06
7	Denmark	192	0.92
8	Finland	234	1.12
9	France	880	4.23
10	Germany	758	3.64
11	Greece	151	0.73
12	Hungary	17	0.08
13	India	213	1.02
14	Indonesia	65	0.31
15	Ireland	115	0.55
16	Italy	384	1.84
17	Japan	3087	14.83
18	Korea, Rep.	414	1.99
19	Netherlands	310	1.49
20	Norway	201	0.97
21	Poland	54	0.26
22	Portugal	95	0.46
23	Russian Federation	123	0.59
24	South Africa	293	1.41
25	Spain	353	1.7
26	Sweden	443	2.13
27	Switzerland	516	2.48
28	Turkey	58	0.28
29	United Kingdom	2570	12.35
30	United States	6281	30.18

Sensing green opportunities

Sensing captures the degree to which MNE managers keep track of changes in the stakeholder environment and build awareness of opportunities and threats (Lessard, Teece, & Leih, 2016; Teece, 2007). To measure the sensing of green opportunities, we use the degree to which the focal company is aware that "climate change can represent commercial risks and/or opportunities" (ASSET4 code: ENERO22S). As argued earlier, such awareness is a strong trigger of changes to firm policies and investments (Huang et al., 2018; Mithani, 2017). The final measure of sensing is continuous, with a larger score indicating that the firm is better able to sense green opportunities.

Seizing green opportunities

Seizing emphasizes how sensed opportunities are addressed through organizational policies and decisions (Helfat & Peteraf, 2015; Teece, 2007). ASSET4 distinguishes three types of environmental issues: emission reduction, resource reduction, and environmental innovation. We obtain scores regarding the focal firm's policies on each environmental issue (ASSET4 code: ENERD01S, ENPID01S, and ENRRD01S) and use the average score as the final measure. ENERD01S measures the degree to which a firm has a policy for reducing environmental emissions, affecting biodiversity, or maintaining an environmental management system. ENPID01S measures the degree to which a firm has a policy on environmental product innovation. ENRRD01S measures the degree to which a firm has a policy on reducing the use of natural resources. Assessing the internal consistency of the three dimensions of seizing green opportunities suggests that these variables load on a common factor (eigenvalue = 2.127) with a Cronbach's alpha of 0.791, indicating satisfactory reliability. Overall, a larger score represents greater seizing of green opportunities by the focal MNE.

Reconfiguring green resources

Reconfiguring captures the degree of change through the integration, reallocation, and recombination of resources (Buysse & Verbeke, 2003; Teece, 2007). Following past studies that argue that innovation is a key mechanism for reconfiguring resources (Helfat & Raubitschak, 2000; Henderson & Cockburn, 1994), we focus on the introduction of sustainable products and features. The measure for reconfiguring reflects the average scores of environmental products (ENPIO01S), product

impact minimization (ENPIO16S), and eco-design products (ENPIO13S). These variables indicate satisfactory internal consistency and reliability. They load on a common factor (eigenvalue = 2.005) with a Cronbach's alpha of 0.748. This measure captures the degree to which the focal MNE has reconfigured resources to introduce new products that have positive effects on the environment, reduce negative impact, or promote environmentally preferable use. The final score is continuous and standardized, with a higher value indicating a higher level of reconfiguring.

International diversification

We measure international diversification by the diversity of sales from different foreign countries. Specifically, we calculate 1 minus its Herfindahl index of product sales across different countries, following the diversification literature (Berry, 1971; Simmonds, 1990). A Herfindahl index of product sales considers how sales are distributed across countries and ranges between 0 and 1, measuring the concentration of product sales. By reverse coding it, we obtain a measure of how diversely product sales are distributed across countries.

International environmental certification

The measure for international environmental certification reflects the focal MNE's participation in the ISO 14000 standard. The ISO 14000 is a family of globally recognized standards that provide guidelines on how firms can better manage their responsibilities toward the natural environment. Like other ISO standards on quality management, the ISO 14000 is awarded to a firm after a process of certification and auditing. The final score is a time-variant dummy variable indicating whether the firm has been certified with ISO 14000 series standards.

Control variables

We control for a set of variables that could affect the degree of seizing green opportunities or reconfiguring green resources. At the firm level, we control for the logged value of assets, price-to-book ratio, return on equity, leverage ratio, degree of product diversification, logged value of sales, and logged value of employee number because larger firms with low growth potential, more financial slack, more profit, higher product diversification, and higher revenues tend to commit more resources to improving corporate environmental performance (Kang, 2013; Van Beurden & Gössling, 2008). We include six controls at the country level. We control for trade openness, measured by the percentage of imports and exports in GDP, and the financial development of the home country, measured by the overall financial development index (Svirydzenka, 2016). Economic openness and better access to finance can impact an MNE's initiatives to renew its capabilities (El Ghoul, Guedhami, & Kim, 2017). We also control for the level of human capital development and technical development, which can affect the innovative capacity in the focal country. We use the number of years in schooling before tertiary education as a proxy for the strength of human capital development and the number of patents filed as a proxy for technical development. Finally, we control for the strength of pro-market institutions and the stringency of national environmental policy, both of which can affect corporate green behaviors. We adopt the Heritage Foundation's measure of economic freedom to proxy for the pro-market institution, which is based on 12 quantitative and qualitative factors (Doh, Teegen, & Mudambi, 2004) grouped into four broad pillars of economic freedom. We obtain information on home-country environmental policy stringency from the OECD (Botta & Koźluk, 2014), which measures a broad range of environmental regulations, such as the emission limit value for a given substance, the tax rate for the emission of NO_x, emission trading schemes for CO_2 and SO_x, and R&D subsidies in renewable energy sectors.

Estimation approach

We estimate all of the models with firm-level fixed-effects models with robust standard errors to test the hypotheses. We control for all of the time-invariant unobserved country-level and firm-level heterogeneities that could confound our results, such as Hofstede's cultural dimensions, colonial histories (if any), legal origins, and firm history. All cross-sectional variation is absorbed by the constant term, and only longitudinal variation in the sample drives the results (Guillén & Capron, 2016). The use of robust standard errors also accounts for the fact that error terms might differ across firms. To mitigate concerns about reverse causality, we use a 1-year lag for the independent, moderating, and control variables.

We recognize that sensing and seizing green opportunities might be endogenous. For example, an unobserved time-variant factor may drive both sensing and seizing or both seizing and

reconfiguring. Thus, we use the score of the sensing of peer firms (i.e., MNEs operating in the same primary industry and from the same country) as an instrument to test the effect of sensing on seizing. The instrument variable approach requires the instrument to correlate with the independent variable (i.e., sensing) and not be a direct cause of the dependent variable (i.e., seizing). The averaged sensing score from peer firms is a good instrument because it can affect the focal firm's sensing level via mimetic isomorphism (DiMaggio & Powell, 1983), but it would not be a direct cause of a focal firm's seizing activities. It would only have an effect via the focal firm's own sensing, and thus, variations in peer sensing would be exogenous to the focal firm's seizing. Similarly, we use the averaged seizing score of peer firms as an instrument to test the effect of seizing on reconfiguring.

With the instrument variables, we perform regressions using a two-stage residual inclusion (2SRI) approach, which is similar to that of the two-stage least-squares (2SLS) approach in the sense that the second stage is linear (Hausman, 1978). However, instead of carrying the predicted values from the first stage, the 2SRI approach uses residuals from the first stage as a control in the second stage. The 2SRI approach is particularly advantageous for estimating our two-step model with interaction terms. Following past studies (Guillén & Capron, 2016), we use 2SRI in all of the models because it helps us more clearly analyze the effect of each step from sensing to reconfiguring, and unlike 2SLS, it does not require additional steps to create instruments for interaction terms. An increasing number of studies using the 2SRI approach have been published (Guillén & Capron, 2016; Jourdan & Kivleniece, 2017; Rao & Greve, 2018). The baseline estimation models are as follows:

$$\begin{aligned}\text{Seizing}_{it} = {} & \alpha_0 + \alpha_1\text{Sensing}_{it-1} + \alpha_2\text{Firm} \\ & - \text{level controls}_{it-1} + \alpha_3\text{Country} \\ & - \text{level controls}_{it-1} + \alpha_4\text{Peer sensing}_{it-1} \\ & + \mu_i + \varepsilon_{it},\end{aligned}$$

$$\begin{aligned}\text{Reconfiguring} = {} & \alpha_0 + \alpha_1\text{Seizing}_{it-1} + \alpha_2\text{Firm} \\ & - \text{level Controls}_{it-1} + \alpha_3\text{Country} \\ & - \text{level controls}_{it-1} \\ & + \alpha_4\text{Peer seizing}_{it-1} \\ & + \alpha_5\text{Residual from sensing} \\ & - \text{seizing stage}_{it-1} + \mu_i + \varepsilon_{it},\end{aligned}$$

where i indicates firms, t indexes years, μ_i denotes firm-level fixed effects, and ε_{it} denotes an error term.

RESULTS

Table 3 reports the descriptive statistics and correlations for the panel sample of 19,510 firm-year observations. Following past studies using fixed-effects models (Guillén & Capron, 2016), we report within-firm correlations using the year-on-year changes in each variable because they are more relevant. The correlations between the year-on-year changes in sensing, seizing, and reconfiguring are relatively higher than others, which is expected given the theorization of our baseline model and prior developments in the sensing–seizing–reconfiguring framework (Helfat & Peteraf, 2015; Teece, 2007). We mean-center all of the continuous variables to reduce concerns about multicollinearity and to report our results, although using the original values renders consistent estimates. On average, the MNEs in our sample have a return on equity of 20% and are distributed across a variety of industries. The most highly represented industry (banking) takes up less than 6% of the entire sample, and most other industries take up less than 3%. Removing the financial industries does not affect our results.

Table 4 reports all of the regression results. Overall, the more complex models show an improvement in the overall model fit, which suggests the importance of the proposed effects. Model 1a and Model 1b present the baseline fixed-effects OLS models with the control variables. For all other models from sensing to seizing, the residual term from a prior regression, where peer sensing is used as an instrument, is positive and significant, which provides support for the usefulness of this instrument in mitigating potential endogeneity. For all relevant models from seizing to reconfiguring, the residual term from the previous stage and the instrument from peer seizing are both significant; thus, potential selection biases resulting from the prior stage regressions and the endogenous factors influencing seizing are corrected for. Although we do not hypothesize regarding the baseline relationships between sensing, seizing, and reconfiguring, the general expectation is that they are positive (Helfat & Peteraf, 2015; Teece, 2007, 2014), and our findings confirm this. As shown in Model 2a, the effect of sensing on seizing is positive and significant, and in Model 2b, the coefficient for seizing is positive and significant.

Table 3 Summary statistics and correlations.

	Variables	Mean	SD	Min	Max	1	2	3	4	5	6	7	8
1	Reconfiguring	50.6	21.3	24.1	98.8	1							
2	Seizing	55.8	26.8	10.8	96.2	0.094	1						
3	Sensing	50.4	30.3	19.4	100.0	0.097	0.076	1					
4	Assets (log)	16.8	2.7	8.0	27.3	− .030	0.026	0.016	1				
5	Price-to-book (log)	0.7	0.8	− 3.5	8.0	− .048	− .014	− .012	− .093	1			
6	Return on equity	0.2	1.7	− 91.9	144.0	0.0043	− .0069	0.0061	0.035	0.0049	1		
7	Leverage ratio	4.0	19.0	− 753.4	1813.3	− .0018	0.013	− .0029	0.047	0.12	− .22	1	
8	Product diversification	0.4	0.3	0.0	1.0	0.00042	− .007	0.0028	0.0077	− .0062	− .016	0.00028	1
9	Sales (log)	16.3	2.6	4.8	26.2	− .021	0.030	0.0069	0.48	0.021	0.019	0.0095	0.034
10	Employee	9.3	1.6	0.0	14.6	− .013	0.0085	− .01	0.43	− .030	0.0054	4.4E − 05	0.046
11	Trade openness	50.4	28.2	21.2	190.8	− .038	− .017	− .0033	0.097	0.017	0.014	0.0054	− .013
12	Financial development	0.8	0.1	0.3	1.0	− .071	− .01	− .016	0.025	0.14	0.0082	− .0045	− .011
13	Patents/10,000	23.8	20.6	0.0	73.4	− .054	0.0035	− .015	0.079	0.044	− .028	0.0041	0.0042
14	Education	12.3	0.5	11.0	13.0	0.0084	− .0012	0.0041	0.00062	− .013	0.00025	− .00082	0.015
15	Pro-market institution	74.1	6.7	49.8	83.1	− .016	0.025	− .024	0.043	0.034	− .012	− .022	− .020
16	Environment policy stringency	2.4	0.8	0.5	4.1	− .0002	− .023	− .0011	− .013	− .083	0.0019	0.016	0.0088
17	Residuals from peer sensing	0.0	30.5	− 104.9	82.2	− .0099	0.0057	− .22	− .045	− .0025	− .014	0.018	− .013
18	Residuals from sensing to seizing	0.0	24.8	− 75.6	71.6	− .017	− .10	− .017	− .047	0.032	0.0029	− .014	0.001
19	Residuals from peer seizing	0.0	24.5	− 82.0	63.8	− .013	− .098	0.011	− .044	0.014	0.00095	− .011	− .0008
20	International diversification	0.5	0.3	0	1	− .011	0.0066	− .0093	0.015	0.0022	− .0025	− .0037	0.073
21	International environmental certification	0.5	0.5	0	1	0.037	0.14	0.022	0.018	− .0077	− .0027	0.0017	− .0016

		9	10	11	12	13	14	15	16	17	18	19	20
10	Employee	0.39	1										
11	Trade openness	0.16	0.055	1									
12	Financial development	− .018	− .020	− .21	1								
13	Patents/10,000	0.12	0.037	0.18	− .018	1							
14	Education	− .0011	− .0043	0.035	− .074	− .012	1						
15	Pro-market institution	0.054	0.034	0.065	0.20	− .11	0.024	1					
16	Environment policy stringency	− .043	− .0066	− .14	0.11	− .024	− .016	− .025	1				
17	Residuals from peer sensing	− .034	− .023	− .027	− .030	− .048	0.0058	− .027	− .089	1			
18	Residuals from sensing to seizing	− .058	− .032	− .047	0.035	− .092	− .011	− .017	− .097	− .020	1		
19	Residuals from peer seizing	− .056	− .032	− .035	0.014	− .094	0.0017	− .021	− .089	0.095	0.99	1	
20	International diversification	0.0089	− .0026	− .016	− .026	− .006	0.0053	− .0012	0.01	− .013	− .020	− .016	1
21	International environmental certification	0.014	0.008	0.0085	0.0023	− .0022	− .005	0.0044	− .023	− .054	− .18	− .18	− .002

N = 19,510; Pearson correlation coefficients are reported; the absolute value of correlation coefficients greater than 0.015 is significant at the 0.05 level, two-tailed test.

Table 4 Fixed-effects OLS models using the 2SRI approach.

Variables	Sensing to seizing					Seizing to reconfiguring				
	1a	2a	3a	4a	5a	1b	2b	3b	4b	5b
Assets (log)	1.48	1.32	1.36	1.35	1.37	0.28	− 0.30	− 0.33	− 0.35	− 0.38
	(0.058)	(0.077)	(0.069)	(0.072)	(0.068)	(0.768)	(0.731)	(0.702)	(0.677)	(0.655)
Price-to-book (log)	− 0.69	− 0.68	− 0.67	− 0.64	− 0.64	− 1.69	− 1.41	− 1.41	− 1.44	− 1.44
	(0.052)	(0.056)	(0.060)	(0.070)	(0.072)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Return on equity	0.03	0.02	0.02	0.02	0.02	0.06	0.04	0.04	0.04	0.04
	(0.624)	(0.699)	(0.715)	(0.707)	(0.716)	(0.361)	(0.563)	(0.499)	(0.565)	(0.511)
Leverage ratio	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	(0.206)	(0.245)	(0.267)	(0.300)	(0.311)	(0.683)	(0.902)	(0.830)	(0.975)	(0.914)
Product diversification	− 0.38	− 0.42	− 0.40	− 0.49	− 0.48	1.99	1.61	1.68	1.56	1.61
	(0.695)	(0.662)	(0.681)	(0.604)	(0.616)	(0.074)	(0.141)	(0.126)	(0.150)	(0.137)
Sales (log)	2.85	2.80	2.76	2.73	2.71	0.91	0.43	0.38	0.62	0.58
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.319)	(0.604)	(0.646)	(0.442)	(0.478)
Employee (log)	0.61	0.65	0.63	0.62	0.61	0.01	− 0.10	− 0.10	− 0.01	− 0.01
	(0.281)	(0.240)	(0.256)	(0.259)	(0.268)	(0.991)	(0.894)	(0.898)	(0.991)	(0.992)
Trade openness	− 0.00	− 0.01	− 0.00	0.00	0.00	0.29	0.25	0.24	0.24	0.24
	(0.984)	(0.849)	(0.884)	(0.917)	(0.905)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Financial development	− 8.10	− 7.46	− 8.00	− 9.41	− 9.65	− 9.45	− 6.76	− 6.21	− 5.89	− 5.46
	(0.164)	(0.198)	(0.167)	(0.102)	(0.094)	(0.143)	(0.290)	(0.332)	(0.357)	(0.393)
Patents/10,000	0.43	0.43	0.43	0.41	0.41	− 0.03	− 0.11	− 0.11	− 0.08	− 0.07
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.572)	(0.029)	(0.038)	(0.132)	(0.154)
Education	4.18	4.12	4.19	4.52	4.55	0.38	− 0.17	− 0.32	− 0.30	− 0.41
	(0.094)	(0.080)	(0.078)	(0.052)	(0.052)	(0.920)	(0.961)	(0.928)	(0.933)	(0.907)
Pro-market institution	0.40	0.41	0.41	0.43	0.43	0.66	0.60	0.60	0.58	0.58
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Environment policy stringency	3.46	3.25	3.25	3.33	3.33	4.09	3.02	2.98	2.98	2.95
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
International diversification	1.38	1.33	1.31	1.33	1.32	3.26	3.64	3.31	3.62	3.26
	(0.140)	(0.151)	(0.153)	(0.149)	(0.150)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
International environmental certification	11.10	10.86	10.90	11.17	11.18	4.49	4.40	3.11	3.09	4.49
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Residuals from peer firm effects		0.06	0.06	0.06	0.06		0.38	0.39	0.40	0.41
		(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
Residuals from sensing to seizing							− 0.31	− 0.32	− 0.32	− 0.32
							(0.000)	(0.000)	(0.000)	(0.000)
Sensing		0.03	0.02	0.09	0.09		0.13	0.14	0.06	0.07
		(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.001)	(0.000)
Sensing × International diversification **(H1)**			− 0.07		− 0.04					
			(0.001)		(0.071)					
Sensing × International environmental certification **(H3)**				− 0.11	− 0.10					
				(0.000)	(0.000)					

Table 4 (*Continued*)

Variables	Sensing to seizing					Seizing to reconfiguring				
	1a	2a	3a	4a	5a	1b	2b	3b	4b	5b
Seizing × International diversification **(H2)**								0.13 (0.000)		0.11 (0.002)
Seizing × International environmental certification **(H4)**									0.18 (0.000)	0.17 (0.000)
Constant	− 5.85 (0.000)	− 5.84 (0.000)	− 5.74 (0.000)	− 5.16 (0.000)	− 5.13 (0.000)	8.64 (0.000)	6.52 (0.000)	6.34 (0.000)	5.18 (0.000)	5.08 (0.000)
R-square	0.20	0.22	0.22	0.23	0.23	0.08	0.12	0.12	0.13	0.13

P values in parentheses. *N* = 19,510. The number of firms is 2937. Fixed effects are at the firm level for all models.

The first hypothesis proposes that higher international diversification in MNEs moderates negatively the association between sensing and seizing green opportunities, while the second suggests that international diversification moderates positively the association between seizing green opportunities and reconfiguring green resources. As indicated in Model 3a, the interaction term between sensing and international diversification is negative and significant. Figure 1a graphically illustrates this relationship at different levels of international diversification (one standard deviation below and above the mean). Further, in Model 3b, the effect of seizing on reconfiguring becomes stronger as international diversification increases. In Figure 1b, we graphically illustrate this relationship. We plot the 95% confidence interval around the lines, which do not overlap with each other, confirming the interaction results in the regression models. Therefore, H1 and H2 are supported.

The third hypothesis proposes that international environmental certification in MNEs moderates negatively the association between sensing and seizing green opportunities, while the fourth hypothesis proposes that international environmental certification moderates positively the association between seizing green opportunities and reconfiguring green resources. As indicated in Model 4a, the interaction term between sensing and international environmental certification is negative and significant. In Figure 1c, we graphically illustrate this relationship for different values of participation in ISO 14000. Further, in Model 4b, the effect of seizing on reconfiguring is stronger when the focal MNE has international environmental certification. In Figure 1d, we graphically illustrate this relationship. We plot the 95% confidence interval around the lines that do not overlap with each other, confirming the interaction results in the regression models. Therefore, H3 and H4 are also supported.

Our results are robust to additional tests. First, we check whether and confirm that our main results are not driven by outlier countries. For example, although the US has the largest representation in our sample (6281 observations, 31.84% of the sample), our regression results remain largely consistent after removing all US observations. Winsorizing all of the variables at the 1% level, top and bottom, produces consistent results, mitigating concerns regarding outliers. Second, our main results are robust to different specifications of MNEs. Removing all firms with an international

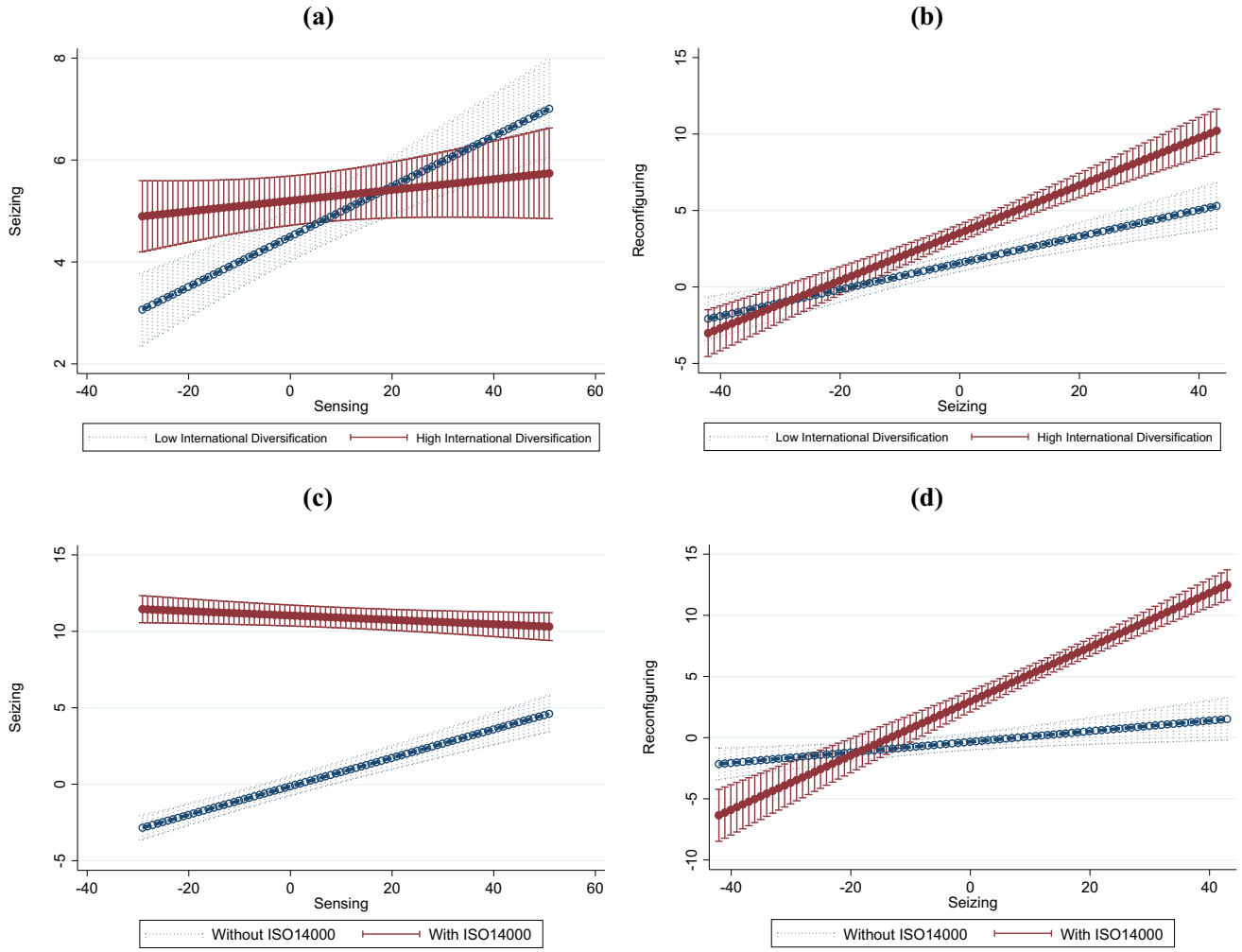

Figure 1 Moderating plots.

diversification score of less than 0.01 generates consistent results in all of the models. Third, we check whether marketing effort can confound the results. The lack of effective, consistent measures for marketing and branding is a common problem in cross-national studies (Hawn & Ioannou, 2015). Following past studies, we use Sales, General, and Administration (SGA) expenses as a proxy for marketing effort and include them as a control. Our results remain consistent. Because SGA expenses are not significant in the models and reduce the sample size by more than half, we exclude these in the main results. Fourth, instead of focusing on international environmental certification, we test the broader effect of participating in international environmental initiatives, such as the United Nations Global Compact. We use a dummy variable indicating whether the MNE is a signatory of the UN Global Compact and find consistent results. Finally, we use alternative measures for sensing, seizing, and reconfiguring and obtain consistent results, as reported in the supplementary file.

DISCUSSION AND CONCLUSION

We study how global connectedness can help MNEs cultivate the dynamic capabilities needed to improve environmental sustainability. MNEs are under constant scrutiny by various stakeholders for their environmental practices, resulting in frequent criticism of their lack of motivation in this regard (Banerjee, 2008; Campbell et al., 2012; Li & Zhou, 2017). The common assumption is that MNEs are resource-rich and can afford to invest in sustainability. From our perspective, becoming greener is also a matter of capability, and because the stakeholder environment is very dynamic, we focus on

dynamic capabilities. A key implication of our study is that dynamic capabilities provide a useful foundation for analyzing the management of environmental sustainability, and possibly sustainability in general. Thus, a central question in this area is how to cultivate the needed dynamic capabilities. Our main proposition is that global connectedness provides key knowledge advantages in cultivating these dynamic capabilities. This instrumental role of building global connections provides important insights into how to make dynamic capabilities actionable for international business.

To facilitate the analysis of environmental sustainability management through a dynamic capability lens, we introduce the notion of dynamic green capabilities, which emphasizes the need to proactively orchestrate investments in path-dependent and organizationally embedded competences to align with a fast-changing stakeholder environment. In our analysis, we build on Teece's (2007) work and apply the sensing–seizing–reconfiguring framework to MNEs, but our approach has two distinguishing features. First, we do not include sensing and seizing in the definition of dynamic green capabilities, but rather view them as important antecedents. While incorporating sensing and seizing into the dynamic capability construct could lead to greater sophistication of the construct and confusion about dynamic capabilities, sensing and seizing are key managerial functions that help explain how dynamic capabilities can be managed and become more actionable. Indeed, the empirical results from applying the sensing–seizing–reconfiguring framework indicate a specific co-evolutionary sequence in the requisite accumulation of green resources along the five domains described by Buysse and Verbeke (2003), such that changes in strategic planning through sensing drive investments in formal management systems through seizing, which spurs reconfiguration through investments in green and organizational competences. Second, although we analyze the relationships between sensing, seizing, and reconfiguring sequentially, as prescribed by Teece (2007), and find support for such a sequence, this logic is not the only possible route for the cultivation of dynamic capabilities. While the infusion of resources retains dynamism, it may also change the underlying microfoundations and processes, thereby creating momentum for alternative sequences. In one of our additional analyses, we find that reconfiguring in one period stimulates sensing in the following period, a point not discussed by Teece. Nevertheless, studying alternative sequences of sensing, seizing, and reconfiguring was not an objective of our study. Future research could advance our understanding in this regard.

The application of the sensing–seizing–reconfiguring framework helps us identify the specific mechanisms by which global connectedness helps cultivate dynamic green capabilities, providing actionable areas for managers in international business. First, global connectedness helps MNEs perform key tasks in knowledge access, acquisition, sharing, and integration, which suggests that advantages in managing knowledge are central to cultivating dynamic green capabilities. Global connectedness is only one mechanism for fostering such knowledge advantages. Second, our findings reveal two very different roles for global connectedness. Global connectedness plays a substitution role in the relationship between the antecedents sensing and seizing. It is important to note that the negative interaction effects that we observe do not indicate a weakening effect. Rather, they indicate substitution effects, where global connectedness and sensing are alternative routes to stimulate seizing. Globally connected MNEs are already in a good position to track their stakeholder environment, and hence the importance of sensing is reduced. Interestingly, the two aspects of global connectedness produce slightly different results. While the effect of international environmental certification is strong throughout, that of international diversification is somewhat weaker. The graphical representations in Figure 1 imply a full substitution effect in the former case and a partial substitution effect in the latter. We attribute this difference to the content distinction between international environmental certification, which is directly related to environmental sustainability, and international diversification, which has much broader implications. Global connectedness has a complementary effect on the relationship between seizing and reconfiguring that is equally strong across the two aspects, which underscores the importance of improving knowledge management routines. Third, it is important that despite minor differences, both aspects of global connectedness reveal consistent results, which allows us to generalize the findings. A key implication for managers is that finding ways to improve connectedness with various stakeholders around the world is critical in cultivating dynamic green capabilities and hence in promoting greater environmental sustainability

among MNEs. This observation is consistent with recent observations about the need for MNEs to build greater connections, including cross-sector partnerships, to move beyond "doing no harm" to "doing good" in the context of the Sustainable Development Goals (Van Zanten & Van Tulder, 2018). It also provides a knowledge-based argument in support of globalization and a counterargument to recent skepticism about globalization (The Economist, 2017), at least in the context of environmental sustainability.

Overall, dynamic green capabilities have unique implications for MNEs. First, MNEs face a unique stakeholder environment in which sustainability demands are becoming increasingly strong and diverse. For instance, cosmopolitan consumers are shaping global competition with a heightened need for environmental sustainability (Grinstein & Riefler, 2015). Thus, MNEs are under extreme pressure to reconfigure their resources and build green competences. Our study provides some insights into how to respond to such pressures. Building global connections and strengthening knowledge management routines receive central attention. MNEs do not have to rely solely on sensing to seize green opportunities; rather, they need to recognize the key role of global connections in acquiring relevant knowledge from geographically dispersed stakeholders. In addition, building global connections stimulates stronger internal management of knowledge, which is critical to orchestrating the construction of path-dependent competences and reconfiguring organizationally embedded resources. Thus, our findings offer a blueprint for MNEs aiming to improve environmental sustainability in a dynamic stakeholder environment. Second, as geographically diversified enterprises, MNEs have advantages in terms of greater connectedness to diverse stakeholders around the world. Exploiting such advantages is directly associated with MNEs' ability to address the interaction of local and global issues across a variety of functional areas. This is another angle from which to look at the difference in the substitution effects between international diversification and international environmental certification. Specifically, the former implies access to information on a variety of issues beyond environmental sustainability, making the process of finding managerial solutions more sophisticated, while the latter specifically targets green issues. Nevertheless, the knowledge management advantages from greater connectedness play an important role in stimulating the needed reconfiguring of green resources. Third, given their fundamental knowledge-based advantages, MNEs have the most to gain from augmenting these advantages by building more and diverse connections in the context of environmental sustainability. This observation implies that MNEs are in a better position to be proactive rather than cautious in environmental sustainability and should be able to make the transition from "avoiding harm" to "doing good" more easily than other firms. Indeed, the importance of international green certifications verifies the importance of third-party connections in addressing global environmental issues and in fostering MNEs to cultivate dynamic green capabilities. Overall, our findings on the role of international connectedness are encouraging for MNE managers committed to pursuing greater environmental sustainability.

Our study has several limitations. First, our sample includes mostly listed MNEs, and hence our findings may be less applicable to private corporations. Future research can examine whether dynamic green capabilities apply differently to private MNEs. Second, our observation window covers the period from 2002 to 2013, when the globalization movement was at its peak, but recent political events such as Brexit and the rise of US protectionism suggest some reversal of this trend. Future research could address whether MNEs can develop novel strategies to develop green capabilities in an era of de-globalization. Third, we do not discuss the supportive organizational infrastructure needed for dynamic green capabilities. We acknowledge that managerial cognition, leadership skills, and organizational culture are needed to facilitate dynamic capabilities (Helfat & Peteraf, 2015). Moreover, our measures of sensing, seizing, and reconfiguring do not capture specific selection mechanisms in sorting out opportunities, organizational policies, and resource combinations. Future research could explore opportunities to improve these measures. Overall, the proposed framework offers a starting point for researchers to explore the role of dynamic green capabilities in achieving greater environmental sustainability in MNEs.

REFERENCES

Aragón-Correa, J. A., & Sharma, S. (2003). A contingent resource-based view of proactive corporate environmental strategy. *Academy of Management Review,* 28(1), 71–88.

Arora, S., & Cason, T. N. (1996). Why do firms volunteer to exceed environmental regulations? Understanding participation in EPA's 33/50 Program. *Land Economics,* 72(4), 413–432.

Attig, N., Boubakri, N., El Ghoul, S., & Guedhami, O. (2016). Firm internationalization and corporate social responsibility. *Journal of Business Ethics,* 134(2), 171–197.

Banerjee, S. B. (2008). Corporate social responsibility: The good, the bad and the ugly. *Critical Sociology,* 34(1), 51–79.

Bansal, P. (2019). Sustainable development in an age of disruption. *Academy of Management Discoveries,* 5(1), 8–12.

Bansal, P., & Bogner, W. C. (2002). Deciding on ISO 14001: Economics, institutions, and context. *Long Range Planning,* 35(3), 269–290.

Bansal, P., & Roth, K. (2000). Why companies go green: A model of ecological responsiveness. *Academy of Management Journal,* 43(4), 717–736.

Benson, C. (1996). The ISO 14000 international standards: Moving beyond environmental compliance. *North Carolina Journal of International Law and Commercial Regulation,* 22(1), 307–364.

Berry, C. H. (1971). Corporate growth and diversification. *The Journal of Law and Economics,* 14(2), 371–383.

Berry, H. (2014). Global integration and innovation: Multicountry knowledge generation within MNCs. *Strategic Management Journal,* 35(6), 869–890.

Botta, E., & Koźluk, T. 2014. Measuring environmental policy stringency in OECD countries. *OECD Economics Department Working Papers* (1177).

Brammer, S. J., Pavelin, S., & Porter, L. A. (2009). Corporate charitable giving, multinational companies and countries of concern. *Journal of Management Studies,* 46(4), 575–596.

Burchell, J., & Cook, J. (2013). Sleeping with the enemy? Strategic transformations in business-NGO relationships through stakeholder dialogue. *Journal of Business Ethics,* 113(3), 505–518.

Buysse, K., & Verbeke, A. (2003). Proactive environmental strategies: A stakeholder management perspective. *Strategic Management Journal,* 24(5), 453–470.

Campbell, J. T., Eden, L., & Miller, S. R. (2012). Multinationals and corporate social responsibility in host countries: Does distance matter? *Journal of International Business Studies,* 43(1), 84–106.

Cano-Kollmann, M., Cantwell, J., Hannigan, T. J., Mudambi, R., & Song, J. (2016). Knowledge connectivity: An agenda for innovation research in international business. *Journal of International Business Studies,* 47(3), 255–262.

Cantwell, J., & Santangelo, G. (1999). The frontier of international technology networks: Sourcing abroad the most highly tacit capabilities. *Information Economics and Policy,* 11(1), 101–123.

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

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

Dimaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review,* 48(2), 147–160.

Doh, J. P., Teegen, H., & Mudambi, R. (2004). Balancing private and state ownership in emerging markets' telecommunications infrastructure: Country, industry, and firm influences. *Journal of International Business Studies,* 35(3), 233–250.

El Ghoul, S., Guedhami, O., & Kim, Y. (2017). Country-level institutions, firm value, and the role of corporate social responsibility initiatives. *Journal of International Business Studies,* 48(3), 360–385.

Florida, R. (1996). The move to environmentally conscious manufacturing. *California Management Review,* 39(1), 80–105.

Gonzalez-Benito, J., & Gonzalez-Benito, O. (2006). A review of determinant factors of environmental proactivity. *Business Strategy and the Environment,* 15(2), 87–102.

Grinstein, A., & Riefler, P. (2015). Citizens of the (green) world? Cosmopolitan orientation and sustainability. *Journal of International Business Studies,* 46(6), 694–714.

Guillén, M. F., & Capron, L. (2016). State capacity, minority shareholder protections, and stock market development. *Administrative Science Quarterly,* 61(1), 125–160.

Hart, S. L., & Dowell, G. (2011). A natural-resource-based view of the firm: Fifteen years after. *Journal of Management,* 37(5), 1464–1479.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica,* 46(6), 1251–1271.

Hawn, O., & Ioannou, I. (2015). Mind the gap: The interplay between external and internal actions in the case of corporate social responsibility. *Strategic Management Journal,* 37(13), 2569–2588.

Helfat, C. E., & Peteraf, M. A. (2015). Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strategic Management Journal,* 36(6), 831–850.

Helfat, C. E., & Raubitschek, R. S. (2000). Product sequencing: Co-evolution of knowledge, capabilities and products. *Strategic Management Journal,* 21(10–11), 961–979.

Henderson, R., & Cockburn, I. (1994). Measuring competence? Exploring firm effects in pharmaceutical research. *Strategic Management Journal,* 15(S1), 63–84.

Hitt, M. A., Hoskisson, R. E., & Kim, H. (1997). International diversification: Effects on innovation and firm performance in product-diversified firms. *Academy of Management Journal,* 40(4), 767–798.

Hoffman, A. J. (2001). The diffusion of corporate environmental practice. *Organization and Environment,* 14(2), 133–156.

Huang, H. H., Kerstein, J., & Wang, C. (2018). The impact of climate risk on firm performance and financing choices: An international comparison. *Journal of International Business Studies,* 49(5), 633–656.

Husted, B. W., Montiel, I., & Christmann, P. (2016). Effects of local legitimacy on certification decisions to global and national CSR standards by multinational subsidiaries and domestic firms. *Journal of International Business Studies,* 47(3), 382–397.

ISO. 2015. Introduction to ISO 14001. Retrieved March 20, 2019 from https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/introduction_to_iso_14001.pdf.

Jones, J., York, J. G., Vedula, S., Conger, M., & Lenox, M. 2019. The collective construction of green building: Industry transition toward environmentally beneficial practices. *Academy of Management Perspectives*. Advance online publication February 21. https://doi.org/10.5465/amp.2017.0031.

Jourdan, J., & Kivleniece, I. (2017). Too much of a good thing? The dual effect of public sponsorship on organizational performance. *Academy of Management Journal,* 60(1), 55–77.

Kang, J. (2013). The relationship between corporate diversification and corporate social performance. *Strategic Management Journal,* 34(1), 94–109.

Kassinis, G., & Vafeas, N. (2006). Stakeholder pressures and environmental performance. *Academy of Management Journal,* 49(1), 145–159.
King, A. A., Lenox, M. J., & Terlaak, A. (2005). The strategic use of decentralized institutions: Exploring certification with the ISO 14001. *Academy of Management Journal,* 48(6), 1091–1106.
Kolk, A. (2010). Trajectories of sustainability reporting by MNCs. *Journal of World Business,* 45(4), 367–374.
Kolk, A., & Fortanier, F. (2013). Internationalization and environmental disclosure: The role of home and host institutions. *Multinational Business Review,* 21(1), 87–114.
Kolk, A., & Pinkse, J. (2008). A perspective on multinational enterprises and climate change: Learning from "An Inconvenient Truth"? *Journal of International Business Studies,* 39(8), 1359–1378.
Kostova, T., & Zaheer, S. (1999). Organizational legitimacy under conditions of complexity: The case of the multinational enterprise. *Academy of Management Review,* 24(1), 64–81.
Lessard, D., Teece, D. J., & Leih, S. (2016). The dynamic capabilities of meta-multinationals. *Global Strategy Journal,* 6(3), 211–224.
Li, X., & Zhou, Y. M. (2017). Offshoring production while offshoring pollution? *Strategic Management Journal,* 38(11), 2310–2329.
Luo, Y. (2000). Dynamic capabilities in international expansion. *Journal of World Business,* 35(4), 355–378.
Margolis, J. D., & Walsh, J. P. (2003). Misery loves companies: Rethinking social initiatives by business. *Administrative Science Quarterly,* 48(2), 268–305.
Mithani, M. A. (2017). Liability of foreignness, natural disasters, and corporate philanthropy. *Journal of International Business Studies,* 48(8), 941–963.
Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science,* 5(1), 14–37.
Porter, M. E., & van der Linde, C. (1995). Green and competitive: Ending the stalemate. *Harvard Business Review,* 28(6), 128–129.
Ramus, C. A., & Steger, U. (2000). The roles of supervisory support behaviors and environmental policy in employee "ecoinitiatives" at leading-edge European companies. *Academy of Management Journal,* 43(4), 605–626.
Rao, H., & Greve, H. R. (2018). Disasters and community resilience: Spanish flu and the formation of retail cooperatives in Norway. *Academy of Management Journal,* 61(1), 5–25.
Rasche, A., Waddock, S., & McIntosh, M. (2013). The United Nations Global Compact: Retrospect and Prospect. *Business and Society,* 52(1), 6–30.
Rugman, A. M., & Verbeke, A. (1998a). Corporate strategies and environmental regulations: An organizing framework. *Strategic Management Journal,* 19(4), 363–375.
Rugman, A. M., & Verbeke, A. (1998b). Corporate strategy and international environmental policy. *Journal of International Business Studies,* 29(4), 819–834.
Rugman, A. M., & Verbeke, A. (2001). Environmental policy and international business. In A. Rugman & T. Brewer (Eds.), *The Oxford handbook of international business*. Oxford: Oxford University Press.
Rugman, A. M., & Verbeke, A. (2003). Extending the theory of the multinational enterprise: Internalization and strategic management perspectives. *Journal of International Business Studies,* 34(2), 125–137.
Scalera, V. G., Perri, A., & Hannigan, T. J. (2018). Knowledge connectedness within and across home-country borders: Spatial heterogeneity and the technological scope of firm innovations. *Journal of International Business Studies,* 49(8), 990–1009.
Shrivastava, P. (1995). The role of corporations in achieving ecological sustainability. *Academy of Management Review,* 20(4), 936–960.
Simmonds, P. G. (1990). The combined diversification breadth and mode dimensions and the performance of large diversified firms. *Strategic Management Journal,* 11(5), 399–410.
Strike, V. M., Gao, J., & Bansal, P. (2006). Being good while being bad: Social responsibility and the international diversification of US firms. *Journal of International Business Studies,* 37(6), 850–862.
Sviridzenka, K. 2016. *Introducing a new broad-based index of financial development. IMF Working Paper*.
Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal,* 28(13), 1319–1350.
Teece, D. J. (2014). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *Journal of International Business Studies,* 45(1), 8–37.
Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal,* 18(7), 509–533.
The Economist. 2017. The retreat of the global company. Retrieved on January 28, 2017 from https://www.economist.com/news/briefing/21715653-biggest-business-idea-past-three-decades-deep-trouble-retreat-global.
Turkina, E., & Van Assche, A. (2018). Global connectedness and local innovation in industrial clusters. *Journal of International Business Studies,* 49(6), 706–728.
Van Beurden, P., & Gössling, T. (2008). The worth of values – A literature review on the relation between corporate social and financial performance. *Journal of Business Ethics,* 82(2), 407–424.
Van Zanten, J. A., & Van Tulder, R. (2018). Multinational enterprises and the sustainable development goals: An institutional approach to corporate engagement. *Journal of International Business Policy,* 1(3–4), 208–233.
Verona, G., & Ravasi, D. (2003). Unbundling dynamic capabilities: An exploratory study of continuous product innovation. *Industrial and Corporate Change,* 12(3), 577–606.
Wang, S. L., & Li, D. (2019). Responding to public disclosure of corporate social irresponsibility in host countries: Information control and ownership control. *Journal of International Business Studies*, 50(8), 1283–1309.
Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review,* 27(2), 185–203.
Zollo, M., & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science,* 13(3), 339–351.

Supplementary information accompanies this article on the Journal of International Business Studies website (www.palgrave.com/journals).
Accepted by Shaker Zahra, Guest Editor, 27 August 2019. This article has been with the authors for three revisions.