Environmental innovation in foreign subsidiaries: The role of home-ecological institutions, subsidiary establishment mode and post-establishment experience

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Accepted for publication in Journal of World Business

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Abstract

In this study, we argue that foreign subsidiaries of multinational enterprises (MNEs) vary in terms of their engagement in environmental innovation depending on the strength of the MNE's home-ecological institutions. We also propose that the manifestation of this home-institutional effect varies depending on the choice of the subsidiary establishment mode (acquisition vs. greenfield) and over time based on the subsidiaries' host experience. We test our hypotheses using a sample of foreign subsidiaries in Spain over the period 2003-2015. Our results support the home-institutional effect on subsidiary-level environmental innovation as well as the moderating effects of the subsidiary establishment mode and host experience.

Keywords: environmental innovation; regulatory institutions; multinational enterprises; institutional theory; establishment mode

1. Introduction

Environmental issues in international business (IB) are complex for a variety of reasons including scientific uncertainties about the consequences of pollution, disagreements about the costs vs. the benefits of environmental protection schemes, and cross-country differences regarding environmental regulations (and their enforcement) (Baron, 2001, 2003; Christmann & Taylor, 2002). The importance of firms' environmental innovation as a means of contributing to the sustainable development of countries has increased significantly over the past few years (Cainelli, Mazzanti, & Montresor, 2012; De Marchi, 2012; Del Río, Peñasco, & Romero-Jordán, 2015). Environmental innovations are broadly defined as "[innovations in] new or modified processes, techniques, practices, systems and products to avoid or reduce environmental harms" (Beise & Rennings, 2005, p. 6) or innovations that "serve to prevent or reduce anthropogenic burdens on the environment, clean up damage already caused or diagnose and monitor environmental problems" (VINNOVA, 2001, p. 14).

Environmental innovations are a subset of a broader set of eco-innovations. Although the terms eco-innovation and environmental innovation are sometimes used interchangeably in the literature, the former is defined at a general level to capture any innovation that can lead to a reduction of environmental impact, irrespective of whether such an effect was intended (Carrillo-Hermosilla, Del Río, & Könnölä, 2010). As such, eco-innovation may be environmentally motivated but may also occur as a side effect of other goals such as reducing production costs (Machiba, 2009). In contrast, the definition of environmental innovation focuses on the intentions of innovators and captures "environmentally motivated innovations" (Carrillo-Hermosilla, et al., 2010), which is the focus of our study.

Engaging in environmental innovation is considered to be the next step beyond the adoption of voluntary environmental programs (e.g., ISO-14001 or Eco-Management and Audit Scheme) because environmental innovations require a greater level of commitment to the environment (Boiral,

Guillaumie, Heras-Saizarbitoria, & Tayo Tene, 2018; Kawai, Strange, & Zucchella, 2018). Multinational enterprises (MNEs), due to their technological and financial prowess, have great potential to engage in environmental innovation through both investment in research and development (R&D) and the diffusion of knowledge from global markets and supply chains (Chang & Gotcher, 2020; Hofman, Blome, Schleper, & Subramanian, 2020). MNEs also face greater pressures in undertaking greener practices and innovations due to their international presence. Prior research argues that both the domestic and international dimensions of a firm's institutional environment, including international regulations, foreign customers, foreign equity, international funding sources, and cooperation with international institutions, determine the extent to which firms undertake environmental innovation (Peñasco, del Río, & Romero-Jordán, 2017).

However, when MNEs engage in environmental innovation at a foreign subsidiary level, there are additional complexities. Foreign subsidiaries are faced with institutional duality, i.e., potentially conflicting institutional pressures from *within* the MNE and from the *external* environment of the host country in which they operate (Hillman & Wan, 2005; Nell, Puck, & Heidenreich, 2015; Zhang, Zhao, & Ge, 2016). Institutional pressures have been previously argued as the most important factor determining environmental innovation (Cainelli, et al., 2012; Chen, Yi, Zhang, & Li, 2018; Hemmelskamp, 1997; Horbach, 2008). Stringent environmental regulations set by governments, for instance, pressure firms to engage in environmental innovation (Kesidou & Wu, 2020; Porter & Van der Linde, 1995). When MNEs decide to engage in environmental innovation at a foreign subsidiary level, on the one hand, as part of a subsidiary's legitimization process, the extent to which they engage in environmental innovation in the host country should depend on the organizational practices developed at home, inspired by home institutions (Cuervo-Cazurra, Luo, Ramamurti, & Ang, 2018; Marano, Arregle, Hitt, Spadafora, & van Essen, 2016; Wan & Hoskisson, 2003). On the other hand, in countries with lax environmental regulations, subsidiaries may perceive competitive advantages in arbitraging from such institutions and focus less on environmental innovation (Eskeland & Harrison,

2003; Holtbrügge & Dögl, 2012). This is because such weaker ecological institutions encourage firms located in such an environment to pay less attention to environmental issues (Chen, et al., 2018; Del Río, Romero-Jordán, & Peñasco, 2017; Horbach, Rammer, & Rennings, 2012; Kesidou & Wu, 2020). Thus, how environmental innovations carried out by foreign subsidiaries are influenced by home institutional pressures remains an important question.

Prior research has provided a limited understanding of the institutional duality faced by an MNE's foreign subsidiaries and how such duality plays a role when engaging in environmental innovation (Kawai, et al., 2018). To obtain a better understanding, we suggest that it is important to focus more closely on the impact of home institutions on a subsidiary's legitimization process. Recent research, inspired by firms based in emerging markets, has shown that home institutions can play a significant role in shaping the competitive advantages of companies (Cuervo-Cazurra, Luo, et al., 2018). Similarly, within the innovation literature, it is argued that sophisticated and demanding customers (at home), in addition to strong regulations, put pressure on firms to innovate to compete and to undertake innovations in host markets (Rugman & D'cruz, 1993). However, most of the IB research on innovation has primarily focused on the quality of host institutions (e.g., intellectual property rights regimes) to support MNE subsidiaries' innovation activities (Lai, 1998; Park, 2007). Relatedly, prior research has also shown that institutional distance, or differences in the home and host institutional profiles of MNEs, impacts subsidiary outcomes (Chao & Kumar, 2010; Dikova, 2012; Estrin, Baghdasaryan, & Meyer, 2009; Konara & Shirodkar, 2018). However, these studies do not focus on how home institutions impact MNEs' foreign subsidiaries or whether the home effect might decay with greater experience of the subsidiary in the host market. Considering these recent developments and following calls for greater research on this issue (Estrin, Meyer, Nielsen, & Nielsen, 2016), we propose that focusing on the home-institutional factors that drive MNEs' foreign subsidiaries to conduct environmental innovation can provide important insights to the existing research on firms' environmental innovations and contribute to a wide range of literature on the

environmental impact of MNEs. Overall, we suggest that foreign subsidiaries vary in terms of the extent of their engagement in environmental innovation depending on the strength of their MNEs' home-ecological institutions. Therefore, our first research question is as follows: *To what extent do home-ecological institutions affect foreign subsidiaries' levels of environmental innovation in a host country?*

Furthermore, we propose that the effect of MNEs' home-ecological institutions on their foreign subsidiaries' environmental innovation varies according to the subsidiary-establishment strategies and through post-entry experience in the host country. The establishment mode choice (acquisition vs. greenfield) can be an important variable that can moderate the home-institutional effect because an acquired subsidiary would have been embedded in the host environment at the time it was taken over by a foreign firm (Harzing, 2002). The prior embeddedness of the subsidiary in the host country can create inertia against the home-institutional effect. In contrast, greenfield subsidiaries are newly created and have a greater home-institutional effect at the time of establishment (Dikova, 2012; Dikova & Brouthers, 2016). This leads us to our second research question: *To what extent does the aforesaid effect of home-ecological institutions vary between acquisitions and greenfield investments?*

Finally, we propose that the home-institutional effect on foreign subsidiaries' environmental innovations is not static, i.e., the effect changes over time as the foreign subsidiary learns and adapts to the host institution (Contractor, Yang, & Gaur, 2016; Delios & Beamish, 2001; Shirodkar, Konara, & McGuire, 2017; Zahra, Abdelgawad, & Tsang, 2011). Therefore, we expect that with greater post-establishment experience of the subsidiary, the home-institutional effect in undertaking environmental innovations will change. The dynamics of this change depend on whether the subsidiary was established via greenfield or acquisition. For greenfield subsidiaries, one could expect that the home-institutional effect would decay over time with greater adaptation to host institutions. In contrast, acquired subsidiaries could be expected to experience a growth in the home-institutional

effect through its integration with the MNE over time (Mtar, 2010). Consequently, our third research question is as follows: *How does the institutional effect of home-ecological institutions on the level of environmental innovation carried out at foreign subsidiaries change over time between acquisitions and greenfield subsidiaries (as the post-entry tenure increases)?*

We contribute to the literature in several ways. First, and most importantly, we advance the knowledge of firms' environmental innovations in an IB context. Prior research on the determinants of environmental innovation has noted that greater firm-level resources (e.g., technological competency, financial resources) and a variety of external factors (e.g., stringency of environmental regulations, institutional pressures, consumer preferences and competition) drive firms to eco-innovate (del Río González, 2009; Horbach, 2008; Horbach, et al., 2012; Ramus, 2002; Rennings, 2000). We advance this knowledge by examining how home-country institutions impact the extent to which a foreign subsidiary carries out environmental innovation. Second, we highlight that these home-institutional effects can vary over time and are based on the subsidiary establishment's characteristics (i.e., greenfield vs. acquired subsidiaries). Thus, we contribute to the evolving research related to the home institutions and strategies of MNEs (Cuervo-Cazurra, 2011; Li, Xia, Shapiro, & Lin, 2018; Marano, et al., 2016; Wan & Hoskisson, 2003; Zhou & Guillén, 2015) and to the literature on the choice of subsidiary-establishment mode, particularly because the previous literature has given little attention to the post-subsidiary-establishment outcomes (Dikova & Brouthers, 2016). We do this by studying how the home-institutional effect varies based on the establishment mode of the subsidiary (greenfield vs. acquisition) and how such effects enhance or decay over time for greenfield and acquired subsidiaries. We thus contribute to an important IB area through our analysis of foreign subsidiaries' environmental innovations.

In the following sections, we formulate our hypotheses on the relationship between home-ecological institutions and environmental innovation at the foreign subsidiary level and the moderating effects of the establishment mode and the post-entry experience on the home-institutional

effect. We then describe our data and present our findings. Finally, we discuss the results and conclude our paper by highlighting our contributions and the study's limitations and suggesting avenues for future research.

2. Theoretical Background and Hypotheses

2.1. Antecedents of Environmental innovation

The Porter hypothesis (Porter & Van der Linde, 1995) emphasizes that stringent environmental regulations promote environmental innovations by firms in a variety of ways including focusing corporate attention on the potential resource efficiencies and technological improvements gained from minimizing hazardous discharges; raising corporate awareness by disseminating information about pollution and its adverse effects; reducing corporate uncertainty about whether investments in environmental innovation will be valuable; creating pressure, fostering innovative thinking and mitigating agency problems; creating a level-playing field and reducing opportunistic behavior; and promoting innovative behavior that can offset the cost of compliance with lax regulations. Furthermore, recent empirical research shows that in regions where environmental regulations have been stringent, the extent of environmental innovation by firms has been greater (Chen, et al., 2018; Kesidou & Wu, 2020).

Recent literature has proposed a variety of antecedents of environmental innovation by firms. As suggested above, environmental innovations capture the intention of firms to innovate to reduce environmental harm, unlike eco-innovations, which broadly also include innovations that occur as a side effect of environmental management practices (Carrillo-Hermosilla, et al., 2010). In this context, del Rio Gonzalez (2009) finds that both internal resource-based factors (technological competency, financial resources) and external institutional factors (collaborations, partnerships, and market and nonmarket pressures) influence firms to undertake environmental innovations. In a similar vein, Horbach (2008) identifies three categories of determinants of environmental innovations: (1)

regulation and policy determinants, (2) supply-side or push factors (technological capabilities, cost savings, industrial relationships), and (3) demand-side or pull factors (e.g., environmental consciousness and consumers' preferences). Similarly, Hartmann and Uhlenbruck (2015) emphasize that not only regulatory and legal forces but also market and social aspects of institutions within countries create pressures on firms to perform better on the environmental front. For instance, the existence of a strong civic culture, market freedom and social activist pressures are important to drive environmental innovations in addition to regulatory forces. Peñasco et al. (2017) differentiate between the national and international drivers of eco-innovation among Spanish firms and find that whereas some international factors - such as cooperation with international actors - facilitates eco-innovations by firms, other factors, such as international sales and foreign equity, do not. They emphasize that domestic factors play a more significant role in eco-innovations than international pressures. Kawai et al. (2018), focusing on the foreign subsidiaries of Japanese MNEs, suggest that a combination of local and global stakeholder pressures encourages firms to undertake green practices, which consequently leads firms to engage subsidiaries to undertake environmental innovations.

In summary, prior studies suggest that institutional pressures, both local regulations (formal rules and public policies) and sociocultural factors, largely determine environmental innovation as well as firm-level resources (Cainelli, et al., 2012; Chen, et al., 2018; Hemmelskamp, 1997; Horbach, 2008). However, a fundamental limitation of prior research in the context of environmental innovation is that insufficient attention has been given to institutions outside a firm's country of operations. Most of the previous studies on the effect of institutions on innovations (in general) have either focused on the domestic context or on host institutions. However, an MNE subsidiary distinctively faces dual institutional pressures from both its home and host institutional contexts. In particular, understanding how home institutions matter to an MNE's foreign subsidiaries remains an important gap in the literature. The impact of home institutions differs from that of host institutions

because MNEs are born into the institutional framework of the home country, which impacts stakeholders' expectations, especially in an international context. As such, there has been a call for additional research on how MNEs' home institutions impact their foreign subsidiaries' behavior (Estrin, et al., 2016).

2.2. The home-institutional effect

The institutional context of a country encompasses political, legal and societal institutions (DiMaggio & Powell, 1983; Kostova & Roth, 2002; Scott, 1987; Wan & Hoskisson, 2003) and refers to the set of rules and regulations, levels of bureaucracy, market access mechanisms, judiciary government policies, contracting regimes and the levels of stability that influence business activities (Cuervo-Cazurra, 2008). As suggested above, institutional pressures for environmental innovation can be (1) coercive: via strong environmental regulations enforced by governments, (2) normative: via strong civic cultures and consumers' demands or activist groups promoting green products and processes, (3) mimetic: via imitation of competitors and other similar firms' processes and practices (Darnall, Henriques, & Sadorsky, 2008; Delmas & Toffel, 2004). Conformance to these different pressures has been regarded as important for firms in achieving legitimacy (or the social license to operate) among a wide range of stakeholders (DiMaggio & Powell, 1983).

Home institutions are a central issue in IB for several reasons. Prior research focusing on the country-of-origin effect on product image and customers' product purchase decisions, for instance, have been extensively studied in the international marketing literature since the 1960s (Peterson & Jolibert, 1995; Phau & Chao, 2008; Verlegh & Steenkamp, 1999). However, the research on the home-institutional effect on foreign direct investment has only more recently begun to receive attention. Cuervo-Cazurra et al. (2018) suggest two mechanisms through which home institutions create competitive advantages for MNEs' foreign subsidiaries: (1) Institutional learning – whereby firms learn from common challenges in dealing with their home institutions to create competitive

advantages that can be transferred to foreign countries. For example, emerging market firms have advantages over firms from developed countries when operating in other emerging markets due to their greater knowledge of dealing with bribery and other governance problems at home. (2) Competitive learning – whereby intense competition at home, supported by regulatory factors (such as IP protection regimes), forces firms to innovate and use such innovations to compete in foreign markets. Relatedly, prior studies have also utilized organizational imprinting theory (Stinchcombe, 1965) to argue that when firms face similar institutions in their home country, they tend to develop common perspectives and beliefs in response, and these beliefs persist despite future institutional changes (Maksimov, Wang, & Luo, 2017). In general, home institutions cause MNEs to develop their own internal institutions (comprised of values, routines, practices and decisions) that form the basis of their competitive advantage, and these internal institutions persist in light of new (or different) external institutions faced when the MNE enters a new foreign market (Oliver, 1997; Lu, 2002). The home-institutional effect has been reflected in various practices adopted by MNEs' foreign subsidiaries such as the choice of entry mode and international markets (Lu, 2002), innovation (Maksimov et al., 2017), lobbying (Shirodkar et al., 2017), diversification strategies and firm performance (Cuervo-Cazurra, Ciravegna, Melgarejo, & Lopez, 2018; Cuervo-Cazurra, 2011; Marano, et al., 2016; Stoian & Mohr, 2016; Wan & Hoskisson, 2003; Zhou & Guillén, 2015).

Combining institutional theory with the Porter hypothesis, we suggest that strong home-ecological institutions create pressures and incentives for firms (to compete) through their environmental innovations (Chen, et al., 2018). Strong institutions can complement resource-based factors such as strong leadership, financial resources and capabilities in developing proactivity and stakeholder management for sound environmental behavior (Aragón-Correa, Hurtado-Torres, Sharma, & García-Morales, 2008; Blok, Wesselink, Studynka, & Kemp, 2015). For instance, in the 1990s, in the United States (US), the Environmental Protection Agency (EPA) brought about various reforms to strengthen environmental regulations, and, following this, many US-based companies

made substantial commitments to environmental management. Several firms also appointed environmental audit committees and board positions to specifically focus on environmental management and environmental innovations (Baron, 2003). Eventually, these MNEs developed innovative technologies (such as electric cars and solar energy-powered homes) to respond to strong pressures to reduce pollution. Such technologies are now regarded as the basis of their global competitive advantage (Kolk & Pinkse, 2008).

2.3 Home-ecological institutions and foreign subsidiaries' environmental innovation

As a baseline hypothesis, we first argue that an MNE's home-ecological institutions impact the extent to which a foreign subsidiary in a host country will undertake environmental innovation. Specifically, we expect that foreign subsidiaries of MNEs based in countries characterized by strong home-ecological institutions will engage in environmental innovation to a greater extent than the foreign subsidiaries of MNEs based in weaker home-ecological institutions. This is because strong home-ecological institutions influence MNEs to develop stronger capabilities in environmental innovation (Porter & Van der Linde, 1995).

When an MNE enters a new foreign market and decides to engage in environmental innovation in that host market, the extent to which they do so is determined by the MNE's internal institutions regarding the competitive advantages associated with environmental innovation. At the point of creating a new foreign subsidiary, the lack of adequate host-institutional knowledge naturally compels the subsidiary to rely on the mental models regarding environmental innovation developed at the MNE's home base (Holburn & Zelner, 2010). In our case, if an MNE comes from a home country with strong ecological institutions, the MNE will perceive a relatively greater value of environmental innovation (through MNE-level policies and processes), and such a mental model will be transferred to the foreign subsidiary level, for example, via mandates on environmental innovation. In contrast, if the MNE comes from a home country with weak ecological institutions, due to the

fewer pressures and incentives to firms from environmental innovation demand in such countries, the value of environmental innovation will be perceived to be lower, and this mentality will be transferred to the subsidiary level through the MNE. Due to this home-institutional effect and the potential liabilities of newness in the host environment at the point of entry, despite the (relatively stronger or weaker) environmental demands posed by the new (host) environment, the subsidiary will (cognitively) perceive the learning and adoption of the new (host country-specific) ideologies and principles as uncertain and risky as well as socially unjustifiable to their MNE-level (or internal) values and norms (Oliver, 1997). Consequently, we suggest that the nature of home-ecological institutions greatly determines the subsidiary's levels of environmental innovation. Based on this, we hypothesize the following:

Hypothesis 1. *Ceteris paribus, MNEs based in countries with strong ecological institutions are more likely to conduct environmental innovations at the foreign subsidiary level than MNEs based in countries with weaker ecological institutions.*

2.4 The moderating effect of the subsidiary establishment mode

While hypothesis 1 predicts the likely direct effect of home-ecological institutions on foreign subsidiaries' environmental innovation behavior, it offers an incomplete picture. When investing in foreign markets, MNEs often choose among various subsidiary-establishment modes, and the choice of establishing a greenfield subsidiary vs. acquiring a pre-established firm in the host market is an important one.

We suggest that the extent to which home-ecological institutions affect the level of environmental innovation in an MNE's foreign subsidiaries varies based on the establishment mode of the subsidiary in the host country. This is because of the differences in how the effect of home-ecological institutions materialize in greenfield vs. acquired subsidiaries. When an MNE uses a greenfield mode in a host market at the time of establishment, it is more likely to perceive that its

home-based resources and capabilities (in our case, those related to environmental innovation) are important bases of its competitive advantage in the host market (Lu, 2002). Additionally, to develop internal legitimacy, greenfield subsidiaries are more likely to mirror their parents' structures and to rely on capabilities developed at the MNE level (Harzing, 2002). In contrast, in the case of acquisitions, the target (or acquired) firm is expected to be better embedded in the host-institutional environment and to have well-developed structures and ideologies of the host environment. The richness of a subsidiary's local knowledge in the case of acquisition will thus undermine the home-institutional effect. Additionally, when an MNE uses the acquisition mode of establishment, it is likely to perceive that its home-based assets and capabilities are less advantageous to compete in the host market, at least during the time of establishment (Lu, 2002). Therefore, in the case of acquisitions, the MNE is more likely to achieve greater conformity with the host country's institutions by reducing knowledge flow from the home base, thereby reducing the home-institutional effect at the time of establishment. We suggest that this logic also applies to environmental innovation. The choice of establishment mode will thus moderate the relationship between home-ecological institutions and the foreign subsidiary's level of environmental innovation such that the home effect will be stronger in the case of greenfield subsidiaries than for acquisitions. Considering the above arguments we hypothesize the following:

Hypothesis 2. *Ceteris paribus, the effect of home-ecological institutions on the propensity to conduct environmental innovations is stronger in greenfield subsidiaries than in acquired subsidiaries.*

2.5 The moderating effect of post-establishment experience

Building on hypothesis 2, we suggest that the impact of home-ecological institutions on subsidiary-level environmental innovation will be moderated by the subsidiary's post-establishment experience

in the host country and that the nature of this moderating effect will depend on whether the foreign subsidiary was established through greenfield vs. acquisition.

An important mechanism through which foreign subsidiaries' behavior is shaped is through learning about the host context (Johanson & Vahlne, 2009). For example, such learning can be obtained via the experience of previous entry modes into the host country or interactions with local partners or managers. While at the point of establishment, a foreign subsidiary derives its legitimacy by mirroring its parent MNE's values and practices, over time, foreign subsidiaries must learn about host institutions to build their local legitimacy (Luo & Peng, 1999; Moeller, Harvey, Griffith, & Richey, 2013). As such, the extent of institutional duality – pressures to adjust with the host environment vis-à-vis the MNE's internal institutions – will increase with a greater post-establishment experience (Lin, Zheng, Lu, Liu, & Wright, 2019). Subsidiaries that do not learn to adjust to host institutional conditions often find it difficult to survive (Delios & Beamish, 2001). Such learning aspects are important for foreign subsidiaries conducting environmental innovation – for instance, with experience, MNE subsidiaries can identify niche customers demanding green products in the host market that the MNE might be able to serve (Aguilera-Caracuel, Hurtado-Torres, & Aragón-Correa, 2012).

If the host subsidiary is established via a greenfield mode, we expect that the effect of home-ecological institutions on the propensity to conduct environmental innovation will decay over time as the host subsidiary gains experience in the host market. As argued above in our hypothesis 2, if the subsidiary is formed as a greenfield subsidiary, at the point of establishment, the MNE-level mental models and capabilities regarding environmental innovation are more likely to be transmitted to the host subsidiary level (than in the case of an acquisition). This is because, at the point of establishment, the subsidiary lacks thorough knowledge of the host institutions and will consider it risky (and less legitimate) to attempt to adapt its environmental innovations per host-institutional standards. However, over time, with greater host experience, the greenfield subsidiary is expected to

learn to identify and achieve optimal areas of complementarity with external stakeholders in the host country and to be more responsive to host institutional pressures to build its legitimacy (Luo & Peng, 1999; Moeller, et al., 2013). The tension between being embedded in the home-institutional context and within the host country will increase with greater post-establishment experience (Lin, et al., 2019). Therefore, although the effect of home institutions should typically have an enduring impact on the greenfield subsidiary, over time, the substitution of knowledge flows and legitimization processes from the home to the host-institutional context can cause the home-institutional effect to decay.

With regard to environmental innovation, for example, an MNE based in a comparatively weaker home-ecological environment is likely to face 'liabilities of origin (or home)' due to the lower ecological standards in the subsidiary's home country, resulting in negative perceptions of their products and services in the host country (Fiaschi, Giuliani, & Nieri, 2017). Therefore, when such an MNE establishes a greenfield subsidiary in a stronger host ecological environment, the subsidiary, over time, will be expected (by local stakeholders) to catch up on the ecological front. Consequently, the subsidiary should engage in environmental innovation to a greater extent to match the host institutional standards as a means of gaining legitimacy and reducing the liabilities of its home. In contrast, an MNE based in a comparatively stronger home ecological environment, over time, is likely to realize that its environmental innovations are less desirable in the host country due to the lesser demand and fewer institutional pressures and will, therefore, engage in environmental innovation to a lesser extent. The dynamics of this variation also depend on how the host-ecological institutions develop over time compared to those of home. However, given that such institutional changes happen gradually, we expect that, in the case of a greenfield subsidiary, the effect of the home institutions on the subsidiary's environmental innovation behavior is likely to fade with greater host country experience as the subsidiary begins to learn and adapt to the host institutional environment (Delios & Beamish, 2001). Therefore, we hypothesize the following:

Hypothesis 3. *For greenfield investments, the effect of home-ecological institutions on the propensity to conduct environmental innovations is stronger at initial establishment and then decays with MNEs' host country experience.*

In contrast, if the subsidiary was established through the acquisition of an existing firm in the host country, we expect that, over time, the effect of host-ecological institutions on environmental innovations carried out by the subsidiary will be reduced, and simultaneously, there will be an increased effect of home-ecological institutions. This is because, following our argument in hypothesis 2, in the case of an acquisition, at the point of establishment/takeover, the parent-MNE will regard its internal capabilities (inspired by home institutions) to be weaker than that of the acquired firm to compete in the host market and will therefore refrain from transferring such capabilities to the acquired firm at the point of acquisition (Lu, 2002).

During acquisitions, the MNE often regards the acquired firm as a source of valuable knowledge and assets to itself rather than having to develop this knowledge on its own (Jemison & Sitkin, 1986). However, over time, such as during the post-acquisition phase and beyond, the MNE will attempt to integrate the acquired firm into its global operations to achieve legitimacy at both internal (within-MNE) and external (host institutional) levels (Dikova, 2012). This post-acquisition phase involves both the acquirer (i.e., the MNE) and the acquired firm learning from one another (Datta, 1991). Thus, over time, the acquired subsidiary becomes increasingly embedded within the MNE network, which should lead to a strengthening of the MNE's internal institutions and a decay in the effect of host-ecological institutions. For instance, if the MNE comes from a stronger eco-institutionalized country, due to the more positive mentalities and ideologies held by MNE managers regarding the value of environmental innovation, over time, this should lead to an increase in environmental innovations at the host subsidiary level. In contrast, if the MNE comes from a weaker home-institutional environment, over time, this should lead to a reduction in the level of environmental innovations. Thus, we hypothesize the following:

Hypothesis 4. *For acquired subsidiaries, the effect of home-ecological institutions on the propensity to conduct environmental innovations is weaker at the time of entry and then increases with the post-entry experience.*

3. Methods

3.1 Research context and sample

The data used for testing our hypotheses were derived from the Spanish Technological Innovation Panel (PITEC), an annual survey based on the Community Innovation Survey (CIS) framework. This survey was conducted by the Spanish National Statistics Institute (INE) in collaboration with the Spanish Science and Technology Foundation (FECYT) and the Foundation for Technological Innovation (COTEC). The PITEC contains information on firms from all industries in the CNAE classification (National Classification of Economic Activities), which coincides with the statistical classification of economic activities in the European Community (NACE). The dataset used in this study covers the period from 2003 to 2015 (based on thirteen waves of the survey). We track the foreign ownership and the home country by the location of the company headquarters (location of the central office of the group or the parent enterprise). We consider all foreign firms in the PITEC dataset during the sample period. Our sample (sample 1) consists of 1446 firms representing 51 home countries (see appendix A for the list of home countries represented by this dataset).

To test our moderating hypotheses, we used an alternative sample to identify acquired subsidiaries and greenfield subsidiaries and the year of their establishment. We found this information only for the firms that became foreign-owned (i.e., acquired) or established after 2003. We identified acquired subsidiaries by tracking the home country location, i.e., by identifying the cases where the home country changes from Spain to a foreign country. We identified greenfield subsidiaries as the firms that appear in the PITEC dataset within the first three years from its establishment (i.e., new

firms) and are foreign-owned. Our post-2003 invested sample (sample 2) consists of 219 firms (136 acquired subsidiaries and 83 greenfield subsidiaries).

3.2 Measures

Our dependent variable is *environmental innovation*. A few previous studies have measured environmental innovation via self-administered questionnaire surveys (e.g. Amores-Salvadó, Martin-de Castro, & Navas-López, 2015; Eiadat, Kelly, Roche, & Eyadat, 2008; Galbreath, 2019; Kawai, et al., 2018). While this technique allows environmental innovation to be measured through explicit questions, it has also resulted in a relatively fewer number of usable responses (and thus fewer observations), and these surveys were administered only once by individual researchers, resulting in cross-sectional data (Horbach, 2008). Other studies have used green patents as a measure (Fabrizi, Guarini, & Meliciani, 2018; Noailly & Ryfisch, 2015); however, such information is primarily available only at the country level. Few studies have been able to match environmental innovation to firm-level information using other databases, and doing so has also been found to result in relatively small sample sizes (Aragon-Correa & Leyva-de la Hiz, 2016; Faria & Andersen, 2017).

Considering the above discussion, to measure environmental innovation in our study, we followed previous studies (Cainelli, De Marchi, & Grandinetti, 2015; De Marchi, 2012; Del Río, et al., 2015) and used survey items within the PITEC/Spanish innovation survey, which asks whether "lowering environmental impact was a firm's objective of technological innovation". This is a categorical variable with four levels that capture the level of importance on this issue (high, intermediate, reduced and not relevant). We transformed this into a binary variable, where 1 represents the firms stating "high" in the aforementioned question and 0 otherwise. Admittedly, this is not a perfect measure of environmental innovation because the PITEC is not specifically designed to measure environmental innovation. However, such innovation surveys have been conducted yearly in various countries, which allows a greater amount of firm-year data, and the use of such a proxy to

measure environmental innovation has been used in previous studies (e.g. Horbach, 2008; Peñasco, et al., 2017). We address some of the concerns related to our measure in our robustness tests.

Our key explanatory variable is the quality of *home-ecological institutions* of the MNE's home country. We operationalized this variable using the environmental performance index (EPI) of the corresponding home country of the Spanish subsidiary in our sample. The EPI is a widely used quantitative metric for evaluating a country's environmental performance (Wendling, Emerson, Esty, Levy, & Sherbinin, 2018). The EPI was developed by researchers and policy experts at the Yale Center for Environmental Law and Policy (Yale University) and Columbia University's Center for International Earth Science Information Network (CIESIN) alongside the World Economic Forum. The index ranks 180 countries on 24 performance indicators in the following ten issue categories: air quality, water and sanitation, heavy metals, biodiversity and habitat, forests, fisheries, climate and energy, air pollution, water resources, and agriculture. Prior studies have shown that firms based in countries or subnational regions with greater levels of environmental performance are more likely to eco-innovate (Kesidou & Wu, 2020). As such, this mechanism of measuring the effect of home institutions (based on firms' country of origin) is frequently used in prior studies (Ciszewska-Mlinaric, Obloj, & Wasowska, 2018; Shinkle & Kriauciunas, 2012; Shirodkar, et al., 2017; Vidaver-Cohen, Gomez, & Colwell, 2015). However, we use an alternative measure of home-ecological institutions and reanalyze our data as part of our robustness tests.

Other explanatory variables used to test our moderating hypotheses include the *establishment mode* of the subsidiary and the *post-entry experience* of the subsidiary. As described in the previous section, we created a subsample of the firms (post-2003) to identify firms that were *acquired* vs. established as *greenfield* investments. The post-entry experience was measured by the number of years since the MNE established/acquired the subsidiary.

We included several firm-level control variables that can affect the subsidiary's inclination to carry out environmental innovation: (1) *Subsidiary size:* Previous studies acknowledge the positive relationship between firm size and environmental innovation; i.e., the larger the company, the more likely it is to be eco-innovative (Del Río, et al., 2015; Jové-Llopis & Segarra-Blasco, 2020). This could be partially explained because firm size is an indication of a company's resources and innovation capability (Jové-Llopis & Segarra-Blasco, 2020). An additional reason could be the lack of smaller firms' awareness of the cost savings generated by environmental innovation. In line with previous studies, we measured subsidiary size with the log of the total number of employees. (2) *Subsidiary age*: Firm age has been regarded as one of the drivers of environmental innovation (Bitencourt, de Oliveira Santini, Zanandrea, Froehlich, & Ladeira, 2020; Hojnik & Ruzzier, 2016). We measured subsidiary age with the number of years since the firm's establishment in Spain. (3) *R&D intensity*: Research has shown a positive relationship between R&D expenditure and environmental innovation (Bitencourt, de Oliveira Santini, Zanandrea, Froehlich, & Ladeira, 2020) as R&D is an indicator of a company's technological capabilities (Carrillo-Hermosilla et al., 2009) and thus triggers environmental innovations. We measured R&D intensity by internal R&D expenditure as a percentage of sales. Recent studies have also found a curvilinear effect of R&D on innovation (Heij, Volberda, Van den Bosch, & Hollen, 2020; Kim, 2018). For example, Kim (2018) suggests that beyond a certain point, the marginal cost of increasing R&D investment might outweigh the marginal benefits. Similarly, Heij et al. (2020) suggest that beyond a certain point, less of the new technological knowledge acquired through R&D is used due to the additional challenges in integrating and converting new technological knowledge into innovations. Therefore, we include a square term of R&D intensity to account for its potential curvilinear effect on environmental innovation[1]. (4) *Return on employees*: Penasco et al. (2017) empirically demonstrated the positive impact of return on employees on environmental innovation. We measured return on employees by

[1] When we first used R&D intensity in our regressions, the estimated coefficient of the R&D intensity was negative and not significant. We thank a reviewer for this important suggestion to model R&D intensity in a nonlinear specification.

dividing firm turnover by the number of employees. (5) *Collaboration*: Environmental innovations are driven by a higher degree of collaboration with external partners (De Marchi, 2012; Keshminder & del Río, 2019). We measure collaboration with a dichotomous variable that captures whether the firm cooperates with other businesses in its innovation activities. (6) *Human capital*: Human capital encompasses elements such as staff knowledge, skills, expertise and education and is key to developing innovation (Ortega-Lapiedra, Marco-Fondevila, Scarpellini, & Llena-Macarulla, 2019). We measure human capital as the percentage of staff in a firm with academic degrees. (7) *Training expenditure*: Training expenditure per employee has been regarded as an important driving factor for environmental innovations (Horbach, 2008); therefore, we control for this. (8) *Public subsidies:* Penasco et al. (2017) argued that subsidies and funding received from national sources (local, regional, central government) as well as international (EU) sources can increase the likelihood of environmental innovation; therefore, we control for this. (9) *Foreign market*: We included foreign market as a control variable to capture whether the firm exports or not as companies that are serving foreign countries may be exposed to more pressures to focus on environmental issues (Peñasco, et al., 2017). (10) *Industry*: Finally, we include a series of *industry* dummies to control for other industry-level characteristics that could potentially impact the inclination to carry out environmental innovation (Peñasco, et al., 2017). It is important to control for industry fixed effects as a firm's attention to environmental issues can vary not only among industries but also due to differences in industry-level regulations. To maintain the causal relationship between the firm-level control variables and the firm's environmental innovation and to reduce any potential endogeneity between these control variables and the dependent variable, we lagged the following variables by one year: *R&D intensity (and its squared term)*, *Return on employee*, *Training expenditure and Public subsidies.* The sources of all variables and their measurements are summarized in Appendix B. As our dependent variable is a binary variable, we use a random-effects binary logistic model in a panel

data framework to estimate our model. The descriptive statistics and correlation coefficients are presented in Table 1.

*** Insert Table 1 about here ***

4. Results

4.1 Regression results

Table 2 presents the estimated results. Panel 2.1 reports the estimated results for the total sample (all foreign firms). Confirming hypothesis 1, the coefficient of home-ecological institutions is positive and significant, indicating that MNEs originating from countries with better environmental performance are more likely to engage in environmental innovation in a host country (in our case, Spain).

*** Insert Table 2 about here ***

Panel 2.2 reports the estimated results for the post-2003 invested sample. The coefficient of home-ecological institutions is positive and significant. Panels 2.3 and 2.4 report the estimated results for greenfield subsidiaries and acquired subsidiaries, respectively. The effect of home-ecological institutions is positive in both cases but significant only for greenfield investments. Both the coefficient and the significance level of the home-ecological institutional effect are much larger for greenfield subsidiaries than for acquired subsidiaries, in line with hypothesis 2.

To further emphasize the support for hypothesis 2, instead of splitting into two subsamples, we included both greenfield and acquired subsidiaries in one sample and used the partition approach to differentiate the effect of home-ecological institutions on environmental innovation between greenfield vs. acquired subsidiaries. This approach effectively partitions the effect of an explanatory variable (i.e., home-ecological institutions) on the dependent variable (environmental innovation) for the two establishment modes (greenfield vs. acquired subsidiaries) by employing two multiplicative terms that are mutually exclusive and exhaustive. The results are reported in panel 2.5. The coefficient of home-ecological institutions is positive for both greenfield and acquired subsidiaries but only

significant for greenfield subsidiaries. The magnitude of the estimated coefficient is also higher for greenfield subsidiaries than for acquired subsidiaries. This provides support for hypothesis 2.

Panel 2.6 reports the estimated results for greenfield subsidiaries with the interaction term between the home-ecological institutions and post-entry experience. The coefficient of home-ecological institutions is positive and significant, indicating that the effect exists even at the point of the establishment of the subsidiary. The interaction term (*Home-ecological institutions*Post-entry experience*) is negative and significant, indicating that the home-institutional effect decays with post-entry experience, thus supporting hypothesis 3.

Panel 2.7 reports the estimated results for acquired subsidiaries with the interaction term between the home-ecological institutions and post-entry experience. The coefficient of home-ecological institutions is negative but insignificant, indicating that the effect does not exist at the point of acquiring the subsidiary. The interaction term (*Home-ecological institutions*Post-entry experience*) is positive as hypothesized but not significant at the 10% level. Therefore, our hypothesis 4 is not supported. Taken together, the estimated coefficients of the home-ecological institutions and the interaction term provide some indication that the home-institutional effect begins to manifest after the acquisition and strengthens with post-entry experience.

To elaborate on these moderating effects, we also plotted the average marginal effects of home institutions for greenfield investments and acquisitions (Figure 1). For greenfield investments, we can see that the average marginal effects of home institutions decrease with the increase in host country experience. We can also see that the effect size is considerably large; for example, at the time of entry, a one-unit increase in EPI can increase the propensity to carry out environmental innovation by approximately 0.031, and this effect is stable for a period of time soon after establishment and then progressively reduces with the increase in host country experience and becomes close to zero by the end of the graph. For acquisitions, the average marginal effects of home institutions are small (or not positive) immediately after the acquisition. Then, this effect becomes more positive with the

increase in host country experience. We can see that the effect size eventually increases to approximately 0.003 by the end of the graph.

*** Insert Figure 1 about here ***

Furthermore, we re-estimated our models with a logistic model[2] and then plotted the estimated interaction effect for the results based on the Stata *inteff* command (Norton, Wang, & Ai, 2004). Similar to the estimated coefficients for the interaction term, the interaction effect estimated based on the *inteff* command is negative for the greenfield investments and positive for the acquisitions (please see figure 2).

*** Insert Figure 2 about here ***

Among our firm-level control variables, we found that the association between subsidiary size and propensity to carry out environmental innovation is positive and significant. Subsidiary age in panel 2.1 and post-entry experience in panels 2.2-2.5 are positive and significant. The level term of R&D intensity is positive and significant in 2.1 and marginally insignificant in some estimations. The square term of R&D intensity is negative and marginally insignificant in some estimations. Therefore, it seems that there is an inverted U-shaped relationship between R&D intensity and environmental innovation. As expected, collaboration is positive and significant and human capital is positive and significant in most estimations. Public subsidies tend to be positive in general but tend to be negative for greenfield investments.

4.2 Robustness tests

We carried out several tests to confirm the robustness of our results. First, we carried out a robustness test to confirm the robustness of our measure of home-ecological institutions. To this end, we used an alternative measure based on the OECD's Environmental Policy Stringency Index (EPS) (Botta & Koźluk, 2014; OECD, 2020). This index measures the degree to which environmental policies put an

[2] The Stata inteff command cannot be used with random-effects binary logistic models (i.e., with panel data models); therefore, we re-estimated a binary logistic models and then estimated the interaction effects based on the inteff command.

explicit or implicit price on polluting or environmentally harmful behavior. The index ranges from 0 (not stringent) to 6 (highest degree of stringency) and covers 28 OECD and BRIICS countries. This measure focuses more specifically on the regulatory aspect of home institutions and has been used in several studies (Herman & Xiang, 2019; Martínez-Zarzoso, Bengochea-Morancho, & Morales-Lage, 2019). Estimated results based on EPS are reported in table 3. The results are similar to those of table 2. In addition, hypothesis 4 is strongly supported with EPS, indicating that the home-institutional effect begins to manifest after the acquisition and strengthens with post-entry experience. We also plotted the average marginal effects of home institutions for greenfield investments and acquisitions based on the EPS, and these plots also provide strong support for both hypothesis 3 and hypothesis 4 (figure 1).

*** Insert Table 3 about here ***

Second, following the previous studies on environmental innovation, we re-estimated our model using a two-stage Heckman correction procedure to account for any sample selection bias arising from not differentiating environmental innovators from general innovators. A joint estimation of the decisions to innovate and to environmentally innovate is recommended because these two decisions can be closely related. This procedure involves estimating the innovation decision in general in the first stage (selection model) based on a binary logistic model[3] and then estimating the second stage determining the probability that firms will carry out environmental innovation while including an inverse mills ratio derived from the first stage. The estimated results are reported in Table S1 in the supplementary file and are qualitatively similar to our previously estimated results.

[3] Guided by the previous literature and empirical evidence, we included the following variables to predict the firm's underlying propensity to innovate: Subsidiary size and age as subsidiary-level resources can be relevant for subsidiary-level innovation, expenditure on innovation and R&D expenditure as they can directly contribute to innovation and return on employees as firms that enjoy higher returns may be able to afford to divert more resources to innovating activities. We also included training expenditure and a binary variable capturing whether the firm received public financing. In addition, we included variables capturing the human capital, exporting status, market share of the firm, industry-level competition and cultural distance between the home and the host country. We also included a series of industry dummies to control for other industry-level characteristics that could potentially impact the inclination to carry out innovation. The sources of all variables and their measurements included in this first stage are detailed in Appendix A.

Third, we conducted a test to confirm the robustness of our measure of environmental innovation. In our main analysis, we measured environmental innovation following previous studies (De Marchi, 2012; Horbach, 2008) and transformed the four-point scale in the PITEC survey into a dummy variable. However, this transformation resulted in a loss of information. Therefore, we carried out a robustness test using the full information in this variable[4]. Considering all four response categories to this survey question, we re-estimated our models based on a random-effects ordered logistic model. The results, reported in Table S2 in the supplementary file, are largely in line with the main results of our random-effects binary logistic models.

Fourth, we carried out a robustness test to check the effect of a static home-institutional effect. In our main analysis, we use a dynamic measure that simultaneously accounts for both the changes in home ecological pressures for every year (based on the EPI score for year *t*) and the change in the level of environmental innovation at the foreign subsidiary level (based on the survey response corresponding to the same year *t*). To test the effect of a fixed (or static) versus dynamic home institutional effect, we used a static measure of the home-ecological institutions, i.e., keeping the EPI score of the home country at a constant based on the EPI score at the time of subsidiary establishment in the host country. This is because one could argue that the effect of home-ecological institutions on the host subsidiary's level of environmental innovations could be greater in the year in which the subsidiary (greenfield) was founded. The results, available in Table S3 in the supplementary file, remained largely intact for greenfield investments; however, they were weaker for acquisitions. This shows that the static measure (of home-ecological institutions at the time of entry) is relevant for greenfield investments, as the effect is greater at the time of entry for greenfield investments. In contrast, for acquisitions, the home-ecological effect is weaker at the time of acquisition. Therefore, the static measure is less relevant, and the dynamic measure is more applicable as the home-ecological effect will gradually take an effect on the acquired subsidiary. These results also suggest that the

[4] We thank the reviewers for this suggestion.

static measure (of home-ecological institutions at the time of entry) is relevant for greenfield investments, and the dynamic measure (changes in home-ecological institutions) is relevant for both greenfield and acquired subsidiaries. These two contrasting sets of results complement our arguments on how the acquired vs. greenfield establishments manifest the effect of home-ecological institutions with post-entry experience.

Fifth, we also carried out a robustness test including regional dummies where countries were classified into the following regions: the Americas, Asia, Europe, the Middle East, Oceania and Africa. All our results remain intact (see Table S4 in the supplementary file).

Sixth, we split our sample into manufacturing and non-manufacturing and checked whether the estimated effects persist in both samples. We found that these effects are largely consistent across both samples (see Tables S5 and S6 in the supplementary file).

Finally, we split our sample into two samples of lower EPI vs. higher EPI countries (compared to the EPI score of Spain – our host country) and carried out two separate estimations for lower EPI vs. higher EPI countries. The results are reported in Table S7 in the supplementary file. Although we expected the explanatory power of the EPI score to decrease because of the lower variability of the score in the two subsamples, this was not the case, and we found that the home-institutional effect persists in both samples.

5. Discussion

5.1 Theoretical contributions

Our study reinforces the arguments and findings of prior studies that emphasize the influence of home-country institutions – an increasingly important dimension in IB research (Cuervo-Cazurra, Ciravegna, et al., 2018; Cuervo-Cazurra, 2011; Marano, et al., 2016; Zhou & Guillén, 2015) on the activities of MNEs' foreign subsidiaries (in our case, on their environmental innovations).

First, regarding the role of home-ecological institutions on MNEs' environmental innovation in host countries, our results support our first hypothesis that stronger home-ecological institutions increase the propensity of their foreign subsidiaries to engage in environmental innovation. Institutional theory has emerged as the most prominent theory in analyzing firms' environmental management practices and environmental innovations (for a literature review, see Holtbrügge & Dögl, 2012). As an MNE's foreign subsidiary faces institutional pressures from both the home and host country in which it operates (i.e., dual legitimacy pressures), the drivers of environmental innovation among MNEs' foreign subsidiaries can be complex. This is reflected further by the complexity of cross-country differences in institutions that have been shown to drive environmental innovation (Chang & Gotcher, 2020; Eiadat, et al., 2008; Ramus, 2002). We contribute to this discussion theoretically and empirically by arguing that an MNE's home-ecological institutions provide important channels that shape its environmental innovation behavior in foreign countries.

In hypothesis 2, we proposed that the effect of home-ecological institutions on the propensity to carry out environmental innovations is stronger in greenfield subsidiaries than in acquired subsidiaries. Our results support this hypothesis, suggesting that greenfield subsidiaries have a greater effect of home institutions than acquired subsidiaries due to their lack of experience with host institutions at the time of establishment. In hypotheses 3 and 4, we proposed that a subsidiary's post-entry experience can moderate the effect of home-ecological institutions on the propensity to carry out environmental innovations, and we presented two distinct relationships for greenfield vs. acquired subsidiaries. In hypothesis 3, we proposed that for greenfield investments, the effect of home-ecological institutions is stronger at the start of the establishment and then reduces with host country experience. Our results fully supported this. In contrast, for acquired subsidiaries, in hypothesis 4, we proposed that the effect of home is weaker at the time of entry and then increases with the post-entry experience. Although hypothesis 4 was not supported through our main measure of home-ecological institutions using EPI, it was supported through our alternative measure using EPS. Through these

moderating effects, our study reveals the complex picture of how the effect of home ecological institutions can be manifested in greenfield and acquired subsidiaries differently as well as how learning about the foreign institutional environment can affect the home-institutional effect. Thus, we reinforce the importance of learning and experience (Aguilera-Caracuel, et al., 2012) on green practices and innovations in an IB context.

We make important theoretical and methodological contributions by arguing for and testing the moderating effects of establishment mode and post-entry experience. In this regard, we contribute to the few extant IB studies (although, outside the context of environmental innovation) that have studied how the effect of home institutions on the behavior of foreign subsidiaries changes depending on entry mode and experience (Ciszewska-Mlinaric, et al., 2018; Ramachandran & Pant, 2010; Shirodkar, et al., 2017; Stoian & Mohr, 2016; Zhou & Guillén, 2015).

Finally, we contribute to the literature by exploring the curvilinear effect of R&D intensity on environmental innovations. Our findings show that the R&D intensity of the subsidiary has an inverted U-shaped effect on environmental innovations, in line with prior studies that have found a similar effect of R&D on innovations in general (Heij, et al., 2020; Kim, 2018). As such, we suggest that there may be an opportunity cost associated with R&D investment due to the limited capacity of a firm to absorb new knowledge from a high level of R&D investment and to integrate this knowledge into existing innovations (Erden, Klang, Sydler, & von Krogh, 2014), at least in the case of foreign subsidiaries. We, however, suggest that future research is warranted on this relationship as the aforementioned curvilinear effect of R&D intensity is significant only in our full sample but not when we split the sample into greenfield and acquired subsidiaries. The lack of full support could be attributed to the reduced split-sample size. We also do not account for other specific forms of R&D such as extramural R&D that could affect environmental innovations (Horbach, et al., 2012).

5.2 Managerial and policy implications

Our paper provides important implications for managers of MNEs involved in environmental innovation at foreign subsidiary levels. Our findings imply that when conducting environmental innovation at foreign subsidiary levels, the effect of the MNE's home-ecological institutions has an impact on the costs vs. benefits of engaging in environmental innovation. This is because the subsidiaries of MNEs from stronger home-ecological institutions can benefit from stronger MNE-specific ideologies and ecological assets and capabilities, which have a positive effect on the host subsidiary to engage in environmental innovation. However, the subsidiaries of MNEs from weaker home-ecological environments (relative to home) lack such capabilities and, therefore, must catch up and bear greater costs if they aim to engage in environmental innovation at foreign subsidiary levels. MNEs may be able to adjust these costs vs. benefits by using suitable establishment modes (greenfield vs. acquisitions) and by learning about the host market by gaining experience over the long term, as our findings further specify.

Our study also provides some implications for public policymakers. First, strong environmental regulations can not only encourage firms to invest in environmental innovation in the focal country but, as our findings imply, this effect can also spill over to other countries where the firms invest. At the same time, our findings also imply that host governments could benefit from attracting foreign investment from countries with better performance on the environmental front as firms from such countries perform better in environmental innovations. We also find that this effect is immediate for greenfield foreign investments but could take longer for foreign acquisitions. Second, our findings show that government subsidies have a positive effect on the environmental innovations of foreign subsidiaries in general; however, our subsample analysis shows that this is not the case for greenfield subsidiaries. Finally, echoing the findings of previous studies (Aldieri, Carlucci, Vinci, & Yigitcanlar, 2019; Peñasco, et al., 2017), our results show that human capital and collaboration also have a positive effect on the environmental innovations of foreign subsidiaries and hence have policy implications in this regard.

6. Conclusions

Overall, our primary contribution lies in advancing institutional theory in the context of cross-border environmental innovation. We examine the extent to which the strength of an MNE's home-ecological institutions impacts environmental innovation conducted by its foreign subsidiaries in a host country. To test our hypotheses, we focus on Spain as our research context. By adopting institutional theory and building on the Porter hypothesis, we complement the existing knowledge about the determinants of environmental innovation at foreign subsidiary levels. We find that MNEs from countries with greater ecological performance (or a higher level of environmental policy stringency) engage in environmental innovations at a foreign subsidiary level to a greater extent. Our findings also improve our understanding of how this home-institutional effect unfolds over time, in particular, by contrasting greenfield and acquisition establishment modes, which can have different dynamics in terms of how the effect of home-ecological institutions will persist, become more influential, or fade over time. We thus contribute to the important question of how the home country effect can become institutionalized in a foreign subsidiary (Lu, 2002), to what extent subsidiaries adapt to the foreign institutional environment and the inertia faced in this adaptation process. We also contribute by integrating experiential learning perspectives; in this regard, we suggest that with gaining experience in the host country, subsidiaries develop localized knowledge and capabilities that will influence their routines and practices and that, as a result, the home effects on environmental innovation may decay.

Like all academic studies, we acknowledge several limitations of our study that provide avenues for further research. First, although we focus on a large number of home countries to account for a great diversity of home institutions (in line with our research questions), we focus on a single host country (i.e., Spain). Including a larger number of host countries in the future can add valuable insights to our findings. At the same time, our paper presupposes that the mechanisms of institutional and competitive learning are the reason for the different implications of home-ecological institutions

on environmental innovations at the foreign subsidiary level; however, these mechanisms are not captured in our empirical analysis. Future research could examine these mechanisms at a more micro level, probably through a qualitative approach or a questionnaire survey. Future research could also underpin alternative theories such as the resource-based view, because MNEs' resources (such as knowledge and reputation) are also likely to determine environmental innovation conducted at foreign subsidiaries. Another limitation of our study is that we focus on environmental innovations, a subset of a broader set of eco-innovations (Carrillo-Hermosilla, et al., 2010). Future research on the home-institutional effect could be extended to eco-innovations more broadly. PITEC, the panel data we use, includes questions that could be potentially linked to other types of eco-innovation. These questions ask respondents to what extent their objectives of technological innovation activities are related to (1) lowering labor cost per produced unit; (2) reducing the use of materials per produced unit; (3) reducing the use of energy per produced unit; (4) improving health and safety and (5) compliance with regulatory, environmental, health, or safety requirements. The first four questions are not explicitly linked to environmental innovations; however, they can be associated with other types of eco-innovations. The last question (i.e., 5) relates to both environmental and non-environmental regulatory compliance. Therefore, these constructs are more likely to capture both environmentally motivated innovations and environmentally beneficial normal innovations. As such, future research can exploit the dataset to focus on broader aspects of eco-innovation. Despite these limitations, we believe that our study makes valuable contributions to the current knowledge about environmental innovations in international business.

REFERENCES

Aguilera-Caracuel, J., Hurtado-Torres, N. E., & Aragón-Correa, J. A. (2012). Does international experience help firms to be green? A knowledge-based view of how international experience and organisational learning influence proactive environmental strategies. *International Business Review, 21*, 847-861.

Aldieri, L., Carlucci, F., Vinci, C. P., & Yigitcanlar, T. (2019). Environmental innovation, knowledge spillovers and policy implications: A systematic review of the economic effects literature. *Journal of Cleaner Production, 239*, 118051.

Amores-Salvadó, J., Martin-de Castro, G., & Navas-López, J. E. (2015). The importance of the complementarity between environmental management systems and environmental innovation capabilities: A firm level approach to environmental and business performance benefits. *Technological Forecasting and Social Change, 96*, 288-297.

Aragón-Correa, J. A., Hurtado-Torres, N., Sharma, S., & García-Morales, V. J. (2008). Environmental strategy and performance in small firms: A resource-based perspective. *Journal of Environmental Management, 86*, 88-103.

Aragon-Correa, J. A., & Leyva-de la Hiz, D. I. (2016). The influence of technology differences on corporate environmental patents: A resource-based versus an institutional view of green innovations. *Business Strategy and the Environment, 25*, 421-434.

Baron, D. P. (2001). Private politics, corporate social responsibility, and integrated strategy. *Journal of Economics & Management Strategy, 10*, 7-45.

Baron, D. P. (2003). *Business and its environment* (4 ed.): Prentice Hall Upper Saddle River, NJ.

Beise, M., & Rennings, K. (2005). Lead markets and regulation: a framework for analyzing the international diffusion of environmental innovations. *Ecological Economics, 52*, 5-17.

Bitencourt, C. C., de Oliveira Santini, F., Zanandrea, G., Froehlich, C., & Ladeira, W. J. (2020). Empirical generalizations in eco-innovation: A meta-analytic approach. *Journal of Cleaner Production, 245*, 118721.

Blok, V., Wesselink, R., Studynka, O., & Kemp, R. (2015). Encouraging sustainability in the workplace: a survey on the pro-environmental behaviour of university employees. *Journal of Cleaner Production, 106*, 55-67.

Boiral, O., Guillaumie, L., Heras-Saizarbitoria, I., & Tayo Tene, C. V. (2018). Adoption and outcomes of ISO 14001: a systematic review. *International Journal of Management Reviews, 20*, 411-432.

Botta, E., & Koźluk, T. (2014). Measuring environmental policy stringency in OECD countries.

Cainelli, G., De Marchi, V., & Grandinetti, R. (2015). Does the development of environmental innovation require different resources? Evidence from Spanish manufacturing firms. *Journal of Cleaner Production, 94*, 211-220.

Cainelli, G., Mazzanti, M., & Montresor, S. (2012). Environmental innovations, local networks and internationalization. *Industry and Innovation, 19*, 697-734.

Carrillo-Hermosilla, J., Del Río, P., & Könnölä, T. (2010). Diversity of eco-innovations: Reflections from selected case studies. *Journal of Cleaner Production, 18*, 1073-1083.

Chang, K.-H., & Gotcher, D. F. (2020). How and when does co-production facilitate eco-innovation in international buyer-supplier relationships? The role of environmental innovation ambidexterity and institutional pressures. *International Business Review*, 101731.

Chao, M. C.-H., & Kumar, V. (2010). The impact of institutional distance on the international diversity–performance relationship. *Journal of World Business, 45*, 93-103

Chen, X., Yi, N., Zhang, L., & Li, D. (2018). Does institutional pressure foster corporate green innovation? Evidence from China's top 100 companies. *Journal of Cleaner Production, 188*, 304-311.

Christmann, P., & Taylor, G. (2002). Globalization and the environment: Strategies for international voluntary environmental initiatives. *Academy of Management Perspectives, 16*, 121-135.

Ciszewska-Mlinaric, M., Obloj, K., & Wasowska, A. (2018). Internationalisation choices of Polish firms during the post-socialism transition period: The role of institutional conditions at firm's foundation. *Business History, 60*, 562-600.

Contractor, F., Yang, Y., & Gaur, A. S. (2016). Firm-specific intangible assets and subsidiary profitability: The moderating role of distance, ownership strategy and subsidiary experience. *Journal of World Business, 51*, 950-964.

Cuervo-Cazurra, A. (2008). The multinationalization of developing country MNEs: The case of multilatinas. *Journal of International Management, 14*, 138-154.

Cuervo-Cazurra, A., Ciravegna, L., Melgarejo, M., & Lopez, L. (2018). Home country uncertainty and the internationalization-performance relationship: Building an uncertainty management capability. *Journal of World Business, 53*, 209-221.

Cuervo-Cazurra, A., Luo, Y., Ramamurti, R., & Ang, S. H. (2018). The Impact of the home country on internationalization. *Journal of World Business, 53*, 593-604.

Cuervo-Cazurra, A. (2011). Global strategy and global business environment: The direct and indirect influences of the home country on a firm's global strategy. *Global Strategy Journal, 1*, 382-386.

Darnall, N., Henriques, I., & Sadorsky, P. (2008). Do environmental management systems improve business performance in an international setting? *Journal of International Management, 14*, 364-376.
Datta, D. K. (1991). Organizational fit and acquisition performance: Effects of post-acquisition integration. *Strategic Management Journal, 12*, 281-297.
De Marchi, V. (2012). Environmental innovation and R&D cooperation: Empirical evidence from Spanish manufacturing firms. *Research Policy, 41*, 614-623.
del Río González, P. (2009). The empirical analysis of the determinants for environmental technological change: A research agenda. *Ecological Economics, 68*, 861-878.
Del Río, P., Peñasco, C., & Romero-Jordán, D. (2015). Distinctive features of environmental innovators: an econometric analysis. *Business Strategy and the Environment, 24*, 361-385.
Del Río, P., Romero-Jordán, D., & Peñasco, C. (2017). Analysing firm-specific and type-specific determinants of eco-innovation. *Technological and Economic Development of Economy, 23*, 270-295.
Delios, A., & Beamish, P. W. (2001). Survival and profitability: The roles of experience and intangible assets in foreign subsidiary performance. *Academy of Management Journal, 44*, 1028-1038.
Delmas, M., & Toffel, M. W. (2004). Stakeholders and environmental management practices: an institutional framework. *Business strategy and the Environment, 13*, 209-222.
Dikova, D. (2012). Entry mode choices in transition economies: The moderating effect of institutional distance on managers' personal experiences. *Journal of East-West Business, 18*, 1-27.
Dikova, D., & Brouthers, K. (2016). International establishment mode choice: Past, present and future. *Management International Review, 56*, 489-530.
DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 147-160.
Eiadat, Y., Kelly, A., Roche, F., & Eyadat, H. (2008). Green and competitive? An empirical test of the mediating role of environmental innovation strategy. *Journal of World Business, 43*, 131-145.
Erden, Z., Klang, D., Sydler, R., & von Krogh, G. (2014). Knowledge-flows and firm performance. *Journal of Business Research, 67*, 2777-2785.
Eskeland, G. S., & Harrison, A. E. (2003). Moving to greener pastures? Multinationals and the pollution haven hypothesis. *Journal of Development Economics, 70*, 1-23.
Estrin, S., Baghdasaryan, D., & Meyer, K. E. (2009). The impact of institutional and human resource distance on international entry strategies. *Journal of Management Studies, 46*, 1171-1196.
Estrin, S., Meyer, K. E., Nielsen, B. B., & Nielsen, S. (2016). Home country institutions and the internationalization of state owned enterprises: A cross-country analysis. *Journal of World Business, 51*, 294-307.
Fabrizi, A., Guarini, G., & Meliciani, V. (2018). Green patents, regulatory policies and research network policies. *Research Policy, 47*, 1018-1031.
Faria, L. G. D., & Andersen, M. M. (2017). Sectoral patterns versus firm-level heterogeneity-The dynamics of eco-innovation strategies in the automotive sector. *Technological Forecasting and Social Change, 117*, 266-281.
Fiaschi, D., Giuliani, E., & Nieri, F. (2017). Overcoming the liability of origin by doing no-harm: Emerging country firms' social irresponsibility as they go global. *Journal of World Business, 52*, 546-563.
Galbreath, J. (2019). Drivers of green innovations: The impact of export intensity, women leaders, and absorptive capacity. *Journal of Business Ethics, 158*, 47-61.
Hartmann, J., & Uhlenbruck, K. (2015). National institutional antecedents to corporate environmental performance. *Journal of World Business, 50*, 729-741.
Harzing, A. W. (2002). Acquisitions versus greenfield investments: International strategy and management of entry modes. *Strategic Management Journal, 23*, 211-227.
Heij, C. V., Volberda, H. W., Van den Bosch, F. A., & Hollen, R. M. (2020). How to leverage the impact of R&D on product innovation? The moderating effect of management innovation. *R&D Management, 50*, 277-294.
Hemmelskamp, J. (1997). Environmental policy instruments and their effects on innovation. *European Planning Studies, 5*, 177-194.
Herman, K. S., & Xiang, J. (2019). Induced innovation in clean energy technologies from foreign environmental policy stringency? *Technological Forecasting and Social Change, 147*, 198-207.

Hillman, A. J., & Wan, W. P. (2005). The determinants of MNE subsidiaries' political strategies: evidence of institutional duality. *Journal of International Business Studies, 36*, 322-340.
Hofman, P. S., Blome, C., Schleper, M. C., & Subramanian, N. (2020). Supply chain collaboration and eco-innovations: an institutional perspective from China. *Business Strategy and the Environment*.
Hojnik, J., & Ruzzier, M. (2016). The driving forces of process eco-innovation and its impact on performance: Insights from Slovenia. *Journal of Cleaner Production, 133*, 812-825.
Holburn, G. L., & Zelner, B. A. (2010). Political capabilities, policy risk, and international investment strategy: Evidence from the global electric power generation industry. *Strategic Management Journal, 31*, 1290-1315.
Holtbrügge, D., & Dögl, C. (2012). How international is corporate environmental responsibility? A literature review. *Journal of International Management, 18*, 180-195.
Horbach, J. (2008). Determinants of environmental innovation—New evidence from German panel data sources. *Research Policy, 37*, 163-173.
Horbach, J., Rammer, C., & Rennings, K. (2012). Determinants of eco-innovations by type of environmental impact—The role of regulatory push/pull, technology push and market pull. *Ecological Economics, 78*, 112-122.
Jemison, D. B., & Sitkin, S. B. (1986). Corporate acquisitions: A process perspective. *Academy of Management Review, 11*, 145-163.
Johanson, J., & Vahlne, J.-E. (2009). The Uppsala internationalization process model revisited: From liability of foreignness to liability of outsidership. *Journal of International Business Studies, 40*, 1411-1431.
Jové-Llopis, E., & Segarra-Blasco, A. (2020). Why does eco-innovation differ in service firms? Some insights from Spain. *Business Strategy and the Environment, 29*, 918-938.
Kawai, N., Strange, R., & Zucchella, A. (2018). Stakeholder pressures, EMS implementation, and green innovation in MNC overseas subsidiaries. *International Business Review, 27*, 933-946.
Keshminder, J., & del Río, P. (2019). The missing links? The indirect impacts of drivers on eco-innovation. *Corporate Social Responsibility and Environmental Management, 26*, 1100-1118.
Kesidou, E., & Wu, L. (2020). Stringency of environmental regulation and eco-innovation: Evidence from the eleventh Five-Year Plan and green patents. *Economics Letters*, 109090.
Kim, K. (2018). Diminishing returns to R&D investment on innovation in manufacturing SMEs: do the technological intensity of industry matter? *International Journal of Innovation Management, 22*, 1850056.
Kolk, A., & Pinkse, J. (2008). A perspective on multinational enterprises and climate change: Learning from "an inconvenient truth"? *Journal of International Business Studies, 39*, 1359-1378.
Konara, P., & Shirodkar, V. (2018). Regulatory Institutional Distance and MNCs' Subsidiary Performance: Climbing up Vs. Climbing Down the Institutional Ladder. *Journal of International Management, 24*, 333-347.
Kostova, T., & Roth, K. (2002). Adoption of an organizational practice by subsidiaries of multinational corporations: Institutional and relational effects. *Academy of Management Journal, 45*, 215-233
Lai, E. L.-C. (1998). International intellectual property rights protection and the rate of product innovation. *Journal of Development Economics, 55*, 133-153.
Li, J., Xia, J., Shapiro, D., & Lin, Z. (2018). Institutional compatibility and the internationalization of Chinese SOEs: The moderating role of home subnational institutions. *Journal of World Business, 53*, 641-652.
Lin, D., Zheng, W., Lu, J., Liu, X., & Wright, M. (2019). Forgotten or not? Home country embeddedness and returnee entrepreneurship. *Journal of World Business, 54*, 1-13.
Lu, J. W. (2002). Intra-and inter-organizational imitative behavior: Institutional influences on Japanese firms' entry mode choice. *Journal of International Business Studies, 33*, 19-37.
Luo, Y., & Peng, M. W. (1999). Learning to compete in a transition economy: Experience, environment, and performance. *Journal of International Business Studies*, 269-295.
Machiba, T. (2009). Sustainable manufacturing and eco-innovation: Framework, practices, and measurement. *Synthesis Report-OECD, Organisation for Economic Co-Operation and Development, Rochester-USA*, 36.
Maksimov, V., Wang, S. L., & Luo, Y. (2017). Institutional imprinting, entrepreneurial agency, and private firm innovation in transition economies. *Journal of World Business, 52*, 854-865.

Marano, V., Arregle, J.-L., Hitt, M. A., Spadafora, E., & van Essen, M. (2016). Home country institutions and the internationalization-performance relationship: A meta-analytic review. *Journal of Management, 42*, 1075-1110.
Martínez-Zarzoso, I., Bengochea-Morancho, A., & Morales-Lage, R. (2019). Does environmental policy stringency foster innovation and productivity in OECD countries? *Energy Policy, 134*, 110982.
Moeller, M., Harvey, M., Griffith, D., & Richey, G. (2013). The impact of country-of-origin on the acceptance of foreign subsidiaries in host countries: An examination of the 'liability-of-foreignness'. *International Business Review, 22*, 89-99.
Mtar, M. (2010). Institutional, industry and power effects on integration in cross-border acquisitions. *Organization Studies, 31*, 1099-1127.
Nell, P. C., Puck, J., & Heidenreich, S. (2015). Strictly limited choice or agency? Institutional duality, legitimacy, and subsidiaries' political strategies. *Journal of World Business, 50*, 302-311.
Noailly, J., & Ryfisch, D. (2015). Multinational firms and the internationalization of green R&D: A review of the evidence and policy implications. *Energy Policy, 83*, 218-228.
Norton, E. C., Wang, H., & Ai, C. (2004). Computing interaction effects and standard errors in logit and probit models. *The Stata Journal, 4*, 154-167.
OECD. (2020). Environmental Policy Stringency Index. In.
Oliver, C. (1997). Sustainable competitive advantage: combining institutional and resource-based views. *Strategic Management Journal, 18*, 697-713.
Ortega-Lapiedra, R., Marco-Fondevila, M., Scarpellini, S., & Llena-Macarulla, F. (2019). Measurement of the Human Capital Applied to the Business Eco-Innovation. *Sustainability, 11*, 3263.
Park, W. G. (2007). Intellectual property rights and international innovation. In *Intellectual property, growth and trade*: Emerald Group Publishing Limited.
Peñasco, C., del Río, P., & Romero-Jordán, D. (2017). Analysing the role of international drivers for eco-innovators. *Journal of International Management, 23*, 56-71.
Peterson, R. A., & Jolibert, A. J. (1995). A meta-analysis of country-of-origin effects. *Journal of International Business Studies, 26*, 883-900.
Phau, I., & Chao, P. (2008). Country-of-origin: state of the art review for international marketing strategy and practice. *International Marketing Review*.
Porter, M., & Van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives, 9*, 97-118.
Ramachandran, J., & Pant, A. (2010). The liabilities of origin: An emerging economy perspective on the costs of doing business abroad. In *The past, present and future of international business & management* (pp. 231-265): Emerald Group Publishing Limited.
Ramus, C. A. (2002). Encouraging innovative environmental actions: what companies and managers must do. *Journal of World Business, 37*, 151-164.
Rennings, K. (2000). Redefining innovation—eco-innovation research and the contribution from ecological economics. *Ecological Economics, 32*, 319-332.
Rugman, A. M., & D'cruz, J. R. (1993). The" double diamond" model of international competitiveness: The Canadian experience. *Management International Review*, 17-39.
Scott, W. R. (1987). The adolescence of institutional theory. *Administrative Science Quarterly*, 493-511.
Shinkle, G. A., & Kriauciunas, A. P. (2012). The impact of current and founding institutions on strength of competitive aspirations in transition economies. *Strategic Management Journal, 33*, 448-458.
Shirodkar, V., Konara, P., & McGuire, S. (2017). Home-institutional imprinting and lobbying expenditure of foreign firms: moderating effects of experience and technological intensity. *British Journal of Management, 28*, 589-608.
Stinchcombe, A. L. (1965). Organizations and social structure. *Handbook of organizations, 44*, 142-193.
Stoian, C., & Mohr, A. (2016). Outward foreign direct investment from emerging economies: escaping home country regulative voids. *International Business Review, 25*, 1124-1135.
Verlegh, P. W., & Steenkamp, J.-B. E. (1999). A review and meta-analysis of country-of-origin research. *Journal of Economic Psychology, 20*, 521-546.
Vidaver-Cohen, D., Gomez, C., & Colwell, S. R. (2015). Country-of-origin effects and corporate reputation in multinational firms: Exploratory research in Latin America. *Corporate Reputation Review, 18*, 131-155.

VINNOVA. (2001). Drivers of environmental innovation. In. Stockholm: VINNOVA - Swedish Governmental Agency for Innovation Systems.
Wan, W. P., & Hoskisson, R. E. (2003). Home country environments, corporate diversification strategies, and firm performance. *Academy of Management Journal, 46*, 27-45.
Wendling, Z., Emerson, J., Esty, D. C., Levy, M. A., & Sherbinin, A. d. (2018). The 2018 Environmental Performance Index Report. In. New Haven, CT: Yale Center for Environmental Law and Policy.
Yale Center for Environmental, L., Policy, Y. Y. U., Yale Data-Driven Environmental Solutions Group - Yale, U., Center for International Earth Science Information Network, C. C. U., & World Economic Forum, W. E. F. (2018). 2018 Environmental Performance Index (EPI). In. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC).
Zahra, S. A., Abdelgawad, S. G., & Tsang, E. W. K. (2011). Emerging multinationals venturing into developed economies: Implications for learning, unlearning, and entrepreneurial capability. *Journal of Management Inquiry, 20*, 323-330.
Zhang, Y., Zhao, W., & Ge, J. (2016). Institutional duality and political strategies of foreign-invested firms in an emerging economy. *Journal of World Business, 51*, 451-462.
Zhou, N., & Guillén, M. F. (2015). From home country to home base: A dynamic approach to the liability of foreignness. *Strategic Management Journal, 36*, 907-917.

Appendix A: List of countries represented in the study

	Model with Environment Performance Index			Model with Environmental Policy Stringency Index		
	No of subsidiaries		Average EPI*	No of subsidiaries		Average EPS*
Country	Total sample	Post-2003 foreign investments		Total sample	Post-2003 foreign investments	
Spain (host country)			63.41			2.60
Armenia	7		50.51			
Australia	5	1	61.88	5	1	2.49
Austria	23	2	70.76	23	2	2.88
Barbados	1		47.87			
Belgium	46	7	64.06	46	7	2.32
Brazil	5	1	59.20	5	1	0.43
Canada	27	5	61.06	27	5	2.90
China	4	2	43.14	4	2	1.28
Czech Republic	1		67.32	1		2.39
Denmark	15	1	66.07	15	1	3.40
Ecuador	1		59.77			
El Salvador	1		51.43			
Estonia	4	1	60.29			
Ethiopia	2		50.49			
Finland	13	1	66.37	13	1	3.09
France	310	40	69.52	310	40	3.09
Germany	278	37	69.43	278	37	2.92
Greece	1		62.43	1		1.98
Hungary	1		59.67	1		2.55
Iceland	2		68.13			
India	11	3	36.05	11	3	1.01
Ireland	9		61.57	9		1.98
Israel	7	2	57.39			
Italy	95	11	70.36	95	11	2.59
Japan	48	7	65.14	48	7	2.29
Jordan	1		44.95			
Kazakhstan	1		37.21			
Kuwait	2		41.37			
Luxembourg	83	9	71.79			
Malaysia	1		62.28			
Mexico	11	3	50.12			
Morocco	2		47.53			
Netherlands	183	10	67.80	183	10	3.19
New Zealand	2		67.46			
Norway	12		71.86	12		2.60
Philippines	1	1	54.71			
Poland	4	1	65.04	4	1	2.34
Portugal	32	4	60.19	32	4	2.31
Saudi Arabia	3		53.42			
Slovakia	1		67.47	1		2.18
Slovenia	1		64.99	1		2.19
South Africa	3		38.66	3		0.82
Sweden	36	2	70.40	36	2	2.97
Switzerland	81	6	79.18	81	6	2.76
Taiwan	1		60.91			
The Gambia	1		35.00			
Turkey	2	1	46.67	2	1	1.56
United Arab Emirates	4	1	54.74			
United Kingdom	164	22	70.44	164	22	2.82
United States of America	302	38	58.90	302	38	2.28
Uruguay	1		57.66			
Total	1852	219		1713	202	

Notes: *Average EPI and EPS are calculated for the period 2003-2015.

Appendix B: Variable description, measurement, and sources

Variable	Description/Measurement	Data Source
INV	A binary variable that captures whether the business introduces new or significantly improved goods/services.	PITEC
E-INV	A binary variable that captures whether lowering environmental impact was a firm's objective of technological innovation. This variable takes the value of one if the level of importance attached to this aspect is "high" and takes the value of zero otherwise (i.e., level of importance is intermediate, reduced and not relevant).	PITEC
E-INV (categorical variable)	A categorical variable capturing 4 levels of importance (3=high, 2=medium, 1=low and 0=nonapplicable) attached to the reduction of environmental impact.	PITEC
Home-ecological institutions (environment performance index)	The environment performance index (EPI) of home country, ranging from 0 (lowest performance) to 100 (highest performance). After 2010, EPI data were available only on a biannual basis (i.e., available only for even years). For the missing odd years (t), we used the average EPI score of the year t-1 and t+1.	(Yale Center for Environmental, Policy, Yale Data-Driven Environmental Solutions Group - Yale, Center for International Earth Science Information Network, & World Economic Forum, 2018)
Home-ecological institutions (Environmental Policy Stringency Index)	An index measuring the stringency of environmental policy ranging from 0 (not stringent) to 6 (highest degree of stringency). Although this index was available for the full sample period of our study (until 2015), for some countries, the index was only available until 2012. For these countries, we used the score of 2012 for 2013-2015.	OECD
Post-Entry Experience	Log (1+ the number of years from the MNE establish/acquired the subsidiary)	PITEC
Subsidiary size	Log (number of employees)	PITEC
Subsidiary age	Log (1+ subsidiary age) – this is for the total sample only	PITEC
R&D intensity	Internal R&D expenditure as a percentage of sales	PITEC
Return on employee	Turnover of the company divided by the number of employees	PITEC
Market share	Market share of the firm (firm revenue as a percentage of the total revenue in the sector)	PITEC
Collaboration	A binary variable that captures whether the firm cooperates with other business in any of its innovation activities	PITEC
Human capital	Percentage of staff with degrees	PITEC
Training expenditure	Training costs per employee	PITEC
Public subsidies	A binary variable that captures whether the firm received public financing (from local/autonomous, state or EU level)	PITEC
Innovation expenditure	Log (1+ expenditure on innovation)	PITEC
Foreign market	Dummy variable that takes the value of one if the firm has an export market and zero otherwise	PITEC
Cultural distance	Cultural distance between Spain and the home country	Hofstede

Table 1: Descriptive statistics and correlations

		Correlation coefficients														
	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	E-INV															
2	HEI (EPI)	0.004														
3	Subsidiary age	0.087***	0.091***													
4	Subsidiary size	0.096***	0.020*	0.229***												
5	Return on employees	-0.006	0.007	0.002	-0.006											
6	R&D intensity	-0.008	-0.001	-0.026**	-0.026**	-0.006										
7	R&D intensity squared	-0.007	-0.001	-0.015	-0.015	-0.003	0.983***									
8	Collaboration	0.082***	-0.168***	-0.023**	0.060***	0.003	-0.005	-0.006								
9	Human capital	-0.025**	0.026**	-0.138***	-0.209***	0.061***	0.038***	0.022**	0.018*							
10	Training expenditure	0.028***	-0.015	-0.032***	-0.020*	0.000	0.001	-0.002	0.036***	0.069***						
11	Foreign market	0.084***	-0.012	0.092***	-0.122***	-0.054***	-0.032***	-0.029***	0.025**	-0.027**	-0.009					
12	Public subsidies	0.114***	-0.023**	-0.019*	0.070***	-0.032***	0.024**	0.017	0.213***	0.070***	0.046***	0.133***				
13	E-INV (categorical variable)	0.773***	0.003	0.104***	0.117***	-0.022**	0.004	0.005	0.130***	-0.068***	0.022**	0.159***	0.180***			
14	HEI (EPS)	0.031***	0.442***	0.074***	0.006	-0.004	-0.012	-0.010	-0.133***	0.040***	-0.012	-0.018	-0.020*	0.028**		
15	Post-Entry Experience	0.085**	0.115***	-0.184***	0.030	-0.061*	-0.014	-0.008	-0.088**	0.103***	0.066*	0.033	-0.099***	0.080**	0.178***	
	Descriptive statistics															
	Mean	0.266	67.615	3.301	5.406	0.002	7.424	91771.308	0.215	25.217	0	0.868	0.312	1.463	2.957	1.527
	Std. Dev.	0.442	7.559	0.684	1.356	0.006	302.865	8.09E+06	0.411	25.438	0.002	0.338	0.463	1.195	0.521	0.799
	Min	0	31.23	0	0	0	0	0	0	0	0	0	0	0	0.375	0
	Max	1	87.67	5.153	10.634	0.325	27331	7.47E+08	1	100	0.07	1	1	3	4.133	2.773

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Estimated results for the baseline model

	Total sample	Post-2003 foreign investments					
		Greenfield and acquisitions	Greenfield	Acquisitions	Greenfield and acquisitions	Greenfield	Acquisitions
	2.1	2.2	2.3	2.4	2.5	2.6	2.7
Home-Ecological Institutions (HEI)	0.0121**	0.0522**	0.0642**	0.00541		0.830***	-0.0288
	(0.00626)	(0.0252)	(0.0375)	(0.0405)		(0.214)	(0.0581)
Greenfield*HEI					0.0769**		
					(0.0355)		
Acquisition*HEI					0.0135		
					(0.0325)		
HEI x Post-Entry Experience						-0.326***	0.0302
						(0.0876)	(0.0377)
Post-Entry Experience		0.741***	1.431***	0.928**	0.937***	23.79***	-1.117
		(0.256)	(0.538)	(0.397)	(0.290)	(6.084)	(2.576)
Acquisition					5.436*		
					(3.181)		
Subsidiary age	0.508***						
	(0.121)						
Subsidiary size	0.332***	0.888***	0.446	1.567***	0.877***	0.458	1.563***
	(0.0608)	(0.225)	(0.285)	(0.391)	(0.220)	(0.305)	(0.393)
Return on employees	-18.95	-7.994	2.538	48.49	-6.203	40.72	49.82
	(20.21)	(34.40)	(55.64)	(215.0)	(30.43)	(50.49)	(218.0)
R&D intensity	0.0126**	0.0229	0.0207	0.0743	0.0246	0.0248	0.0693
	(0.00572)	(0.0205)	(0.0184)	(0.0531)	(0.0208)	(0.0197)	(0.0532)
R&D intensity squared	-1.96e-05	-9.25e-05	-4.34e-05	-0.000506	-0.000101	-5.38e-05	-0.000466
	(1.66e-05)	(0.000126)	(9.13e-05)	(0.000422)	(0.000129)	(9.91e-05)	(0.000418)
Collaboration	0.357***	1.332***	1.921***	1.163*	1.436***	2.266***	1.178*
	(0.100)	(0.389)	(0.536)	(0.678)	(0.395)	(0.593)	(0.676)
Human capital	0.00782***	0.0188**	0.00514	0.0404***	0.0192**	0.000824	0.0408***
	(0.00236)	(0.00767)	(0.00966)	(0.0144)	(0.00761)	(0.0102)	(0.0144)
Training expenditure	8.594	22.48	-2.958	202.0	17.86	-8.591	180.4
	(18.16)	(53.86)	(53.51)	(337.4)	(54.70)	(53.54)	(341.1)
Foreign market	0.316*	0.767	0.413	1.244	0.698	0.849	1.301
	(0.186)	(0.555)	(0.716)	(1.023)	(0.552)	(0.762)	(1.027)
Public subsidies	0.243**	0.126	-0.832*	1.021*	0.157	-0.884*	1.034*
	(0.0962)	(0.344)	(0.496)	(0.547)	(0.344)	(0.519)	(0.548)
Observations	8,532	912	460	447	912	460	447
No. of subsidiaries	1,446	219	83	133	219	83	133
Log likelihood	-3636	-367.6	-192.1	-158.8	-365.5	-183.0	-158.5
chi2	187.6***	41.34***	27.34**	29.20**	45.79***	31.73**	29.15**

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1; one-tailed tests for hypothesized variables, two-tailed tests for controls. Industry-specific dummies are not reported for brevity.

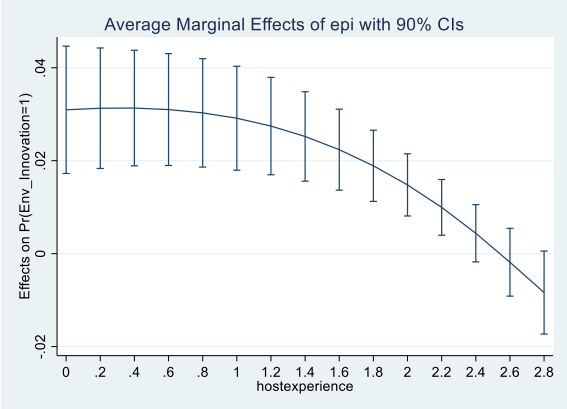
Table 3: Estimated results with the EPS to proxy home-ecological institutions

	Total sample	Post-2003 foreign investments					
		Greenfield and acquisitions	Greenfield	Acquisitions	Greenfield and acquisitions	Greenfield	Acquisitions
	6.1	6.2	6.3	6.4	6.5	6.6	6.7
Home-Ecological Institutions (HEI)	0.506***	0.265	0.114	0.164		8.312***	-1.463
	(0.0948)	(0.390)	(0.548)	(0.662)		(2.602)	(1.044)
Greenfield*HEI					0.479[#]		
					(0.543)		
Acquisition*HEI					-0.109		
					(0.532)		
HEI x Post-Entry Experience						-4.024***	1.661**
						(1.249)	(0.791)
Post-Entry Experience		0.868***	1.597***	1.005**	1.060***	13.95***	-3.983*
		(0.278)	(0.547)	(0.430)	(0.312)	(3.952)	(2.403)
Acquisition					2.783		
					(2.324)		
Subsidiary age	0.429***						
	(0.125)						
Subsidiary size	0.355***	0.902***	0.433	1.621***	0.899***	0.309	1.725***
	(0.0634)	(0.239)	(0.302)	(0.450)	(0.239)	(0.305)	(0.473)
Return on employees	-24.59	-9.477	1.779	4.151	-7.962	19.56	-16.68
	(22.47)	(39.25)	(52.14)	(248.1)	(33.08)	(45.84)	(264.2)
R&D intensity	0.0130**	0.0265	0.0246	0.0802	0.0293	0.0320	0.0810
	(0.00592)	(0.0210)	(0.0187)	(0.0561)	(0.0214)	(0.0208)	(0.0618)
R&D intensity squared	-2.04e-05	-0.000108	-5.65e-05	-0.000553	-0.000120	-8.69e-05	-0.000601
	(1.78e-05)	(0.000130)	(9.34e-05)	(0.000447)	(0.000132)	(0.000110)	(0.000497)
Collaboration	0.359***	1.220***	1.698***	1.335*	1.345***	1.917***	1.446*
	(0.102)	(0.395)	(0.542)	(0.727)	(0.407)	(0.578)	(0.757)
Human capital	0.00752***	0.0203***	0.00654	0.0416***	0.0205***	0.00578	0.0465***
	(0.00242)	(0.00790)	(0.00978)	(0.0154)	(0.00791)	(0.0101)	(0.0162)
Training expenditure	9.844	21.66	1.424	213.5	16.73	-10.11	267.5
	(18.50)	(53.29)	(53.54)	(344.5)	(54.23)	(54.44)	(351.7)
Foreign market	0.394**	0.772	0.479	1.219	0.761	0.509	1.346
	(0.192)	(0.562)	(0.717)	(1.047)	(0.562)	(0.736)	(1.120)
Public subsidies	0.269***	-0.124	-0.864*	0.517	-0.138	-0.894*	0.489
	(0.0991)	(0.360)	(0.504)	(0.582)	(0.362)	(0.524)	(0.604)
Observations	8,101	854	427	422	854	427	422
No. of subsidiaries	1,400	202	76	123	202	76	123
Log likelihood	-3426	-343.3	-183.6	-146.2	-342.1	-177.7	-143.6
chi2	201.2***	35.87***	22.48	23.97*	38.26***	27.66**	25.37*

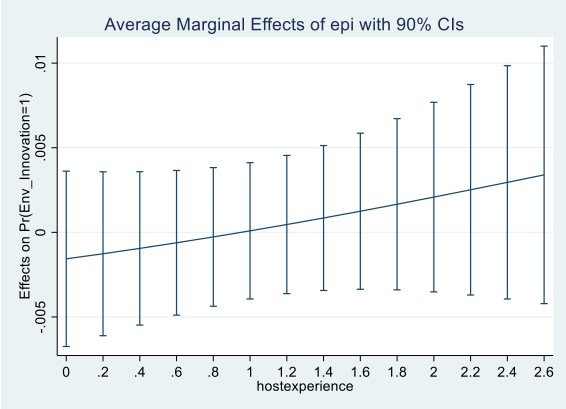
Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, [#] p=0.188; one-tailed tests for hypothesized variables, two-tailed tests for controls. Industry-specific dummies are not reported for brevity.

Figure 1: Average marginal effects of home-ecological institutions for Greenfield investments vs. Acquisitions

Estimated marginal effects based on the EPI

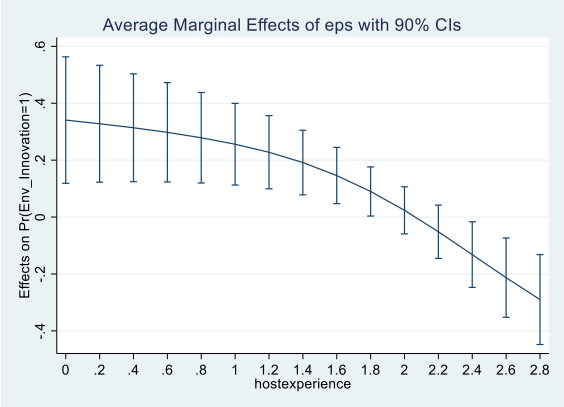


Greenfield investments

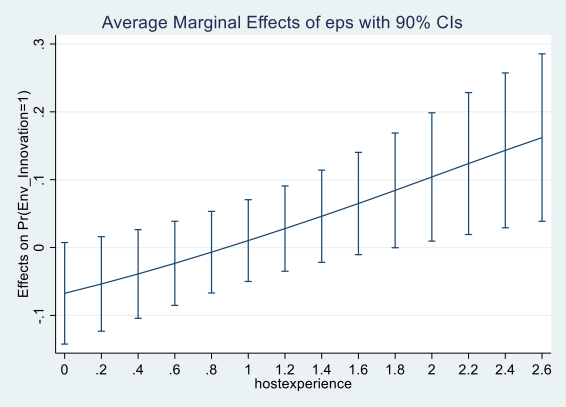


Acquisitions

Estimated marginal effects based on the Policy Stringency Index



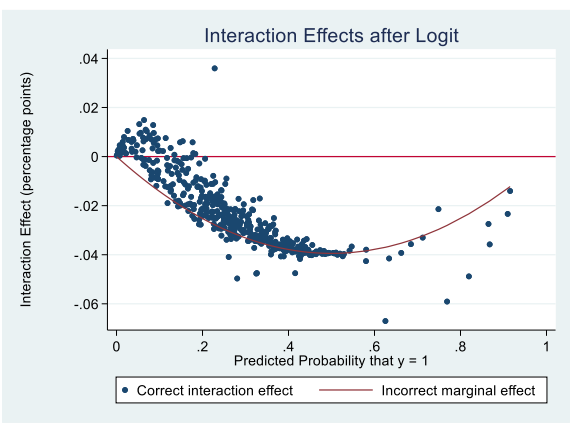
Greenfield investments



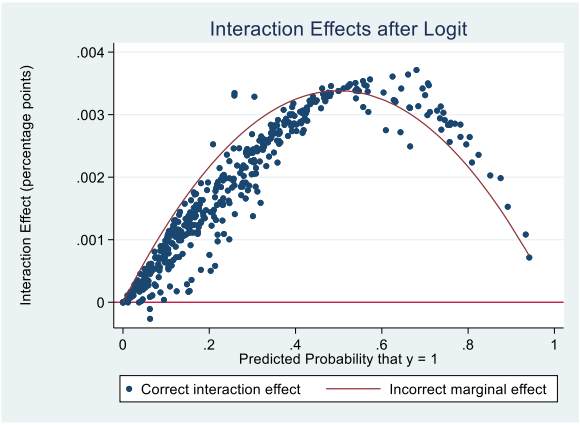
Acquisitions

Figure 2: Estimated interaction effects

Estimated interaction effects based on the EPS

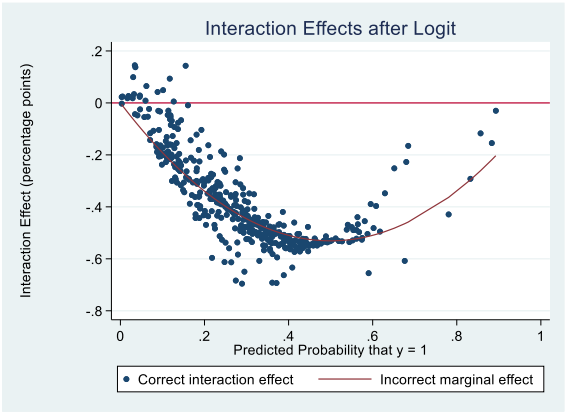


Greenfield investments

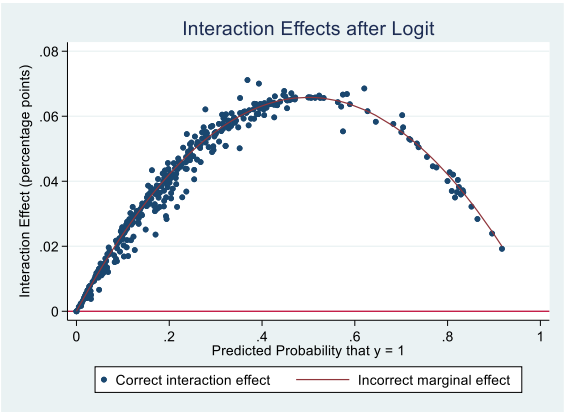


Acquisitions

Estimated interaction effects based on the Policy Stringency Index



Greenfield investments



Acquisitions