RECONSIDERING THE EFFECT OF INTERNAL AND EXTERNAL CONTEXTUAL FACTORS ON SUBSIDIARY'S COMPETENCE-CREATING MANDATES

Abstract

Foreign subsidiaries of multinational corporations (MNCs) are today recognised as being key players in the development of firm-specific advantages, especially in the assimilation and use of external knowledge for innovation. Given this importance, here we examine the subsidiary's R&D role as a contributor to the long-term success of the MNC. Traditionally the drivers of the roles played by subsidiaries within the MNC have been sought in the specific features of the internal corporate and external host country environments. However, we find that favourable internal and external context conditions may not necessarily lead to the enhancement of the subsidiary R&D-contributing role unless dual embeddedness is well established. Adopting a partial least square approach to structural equation modelling, we provide empirical evidence for the interaction of these elements based on a survey of 111 foreign-owned subsidiaries located in Spain. The main contribution of this paper is the development of a multiple mediating model that disentangles the way in which corporate- and country-level factors interrelate with internal and external subsidiary embeddedness in the configuration of high-contributing R&D roles. Specifically, the model brings to the fore the following significant relationships: (1) internal and external embeddedness respectively mediate the relationship of corporate- and country- level factors with subsidiary R&D; (2) dual embeddedness (defined as a three-path mediation where external embeddedness precedes internal embeddedness) also sequentially mediates the relationship between country-level factors and the subsidiary R&D-contributing role.

1. INTRODUCTION

The International Business literature has documented the increasingly important role played by the subsidiaries of multinational corporations (MNCs) in building corporate competitive advantages in an international basis. This phenomenon has its origins in the shift from a perspective of the MNC based on transaction costs and internalization (Buckley & Casson, 1976; Hennart, 1982; Rugman, 1981) to one that takes a resource-based view (Madhok, 1997). Thus, rather than seeking foreign markets so as to exploit rent-yielding firm-specific advantages based primarily on some form of know-how, MNCs have increasingly pursued knowledge-seeking strategies for enhancing and developing new capabilities (Madhok, 1997; Moore, 2001). Accordingly, some subsidiaries are given mandates to explore local knowledge and gain access to expertise that is complementary to the firm (Santangelo, 2012), which when leveraged through the transfer of knowledge between MNC units provides a competitive advantage for the whole corporation (Birkinshaw et al., 1998; Foss & Pedersen, 2004; Frost, 2001).

This latter view has emerged at the same pace as that with which MNC structures have evolved towards network-based systems (Wang & Suh, 2009). The notion of the internationally networked MNC, and its corollary, the geographical dispersal of sources of knowledge (Cantwell, 2009), has recognised the subsidiary's potential to access and share knowledge within two distinct contexts (Ghoshal & Bartlett,

1990): within the MNC itself and with the host countries in which it operates. According to the network model of the MNC, a competence-creating subsidiary absorbs knowledge through its business linkages with local partners, which represents an important source of technological competences enabling it to contribute to the MNC's overall capabilities (Andersson, 2003). This view has revived interest in the location of competence-creating subsidiaries as key players in the promotion of knowledge-seeking strategies that can ensure competitive advantage (Cantwell & Mudambi, 2005; Cantwell, 2009; Nachum & Zaheer, 2005). Thus, here we seek to further this line of research by examining the drivers of high-contributing subsidiaries to firm-specific advantage.

Existing research on subsidiary roles has paid inadequate attention to the impact of subsidiary involvement in corporate and local network linkages (Wang, Liu, & Li, 2009). On the one hand, traditional academic models view the MNC as a set of units operating in multiple environments and the role of each subsidiary, to a large extent, as a function of the characteristics of its local environment (Ghoshal & Nohria, 1989). These models, stemming from the industrial-organizational perspective (Porter, 1990), consider the environment as a determinant force manifested by the dynamism of the local business environment through, for instance, local rivalry, demanding customers, or governmental support (Birkinshaw & Hood, 1998; Foss & Pedersen, 2002; Frost et al., 2002; Holm, Holmström, & Sharma, 2005), which tends to affect all units operating at the same location equally. On the other hand, by focusing on the internal corporate management, many studies have concentrated on the traditional facets of headquarters-subsidiary relationships, such as headquarters control (Ciabuschi, Martin Martin, & Stahl, 2010), coordination mechanisms (Luo, 2005) or the deliberate assignment of mandates (Adenfelt & Lagerström, 2006) used in directing the behaviour of subsidiary managers and, as such, determining subsidiary roles. Other studies have likewise considered subsidiary initiative (Ambos, Andersson, & Birkinshaw, 2010; Birkinshaw, 1997; Delany, 2000; Young & Tavares, 2004), their specific resources (Birkinshaw & Morrison, 1995; Birkinshaw et al., 1998) or their bargaining power (Dörrenbächer & Gammelgaard, 2006), which depend on subsidiary choices in defining themselves. These approaches implicitly assume that the subsidiaries of the same MNC enjoy similar opportunities to draw on the same corporate-level factors.

Nevertheless, in the course of earlier research, it was noted that subsidiaries located in the same country and subsidiaries of the same MNC operating in different countries varied markedly in their ability to fulfil international responsibilities, ranging from their undertaking of multiple global subsidiary mandates to their fulfilling of none whatsoever (Moore, 2001). As such, country-level factors and corporate-level factors by themselves cannot fully account for the heterogeneity of subsidiaries. This situation points to the existence of a third explanatory factor related to unequal access to knowledge resources in both internal and external contexts. This is best captured by the concept of network embeddedness, whereby the way in which, and the extent to which, subsidiaries are embedded in internal and external networks can vary. Differences in their relational embeddedness, understood as the variety of interactions and the quality of the linkages developed by subsidiaries in their surrounding networks (Figueiredo, 2011; Giroud & Scott-Kennel, 2009; Santangelo, 2009), lead to differences in

their levels of absorption, creation and sharing of knowledge, and thereby to the different levels of competences and R&D roles of subsidiaries. This perspective has inspired a recent stream of research concerned with the creation, assimilation and diffusion of knowledge and where the emphasis has been placed on the interface of the subsidiary's dual network embeddedness.

However, this new literature has two major shortcomings: First, there is no consensus about the effect of intra- and inter-organizational network relationships on subsidiary R&D roles. While some authors identify external embeddedness as being responsible for the genesis of subsidiary R&D competencies (Andersson, Björkman, & Forsgren, 2005; Andersson, Forsgren, & Holm, 2007; Mudambi & Navarra, 2004), others place internal embeddedness at the centre of subsidiary innovation processes (Ciabuschi, Dellestrand, & Martin, 2011; Garcia-Pont, Canales, & Noboa, 2009), and even argued in favour of an inverse relationship between internal and external embeddedness (Andersson et al., 2007). The second weakness is that the few studies to date that have adopted a dual embeddedness perspective are flawed when they do not also integrate corporate and country factors in their analyses (see e.g. Figueiredo, 2011; Helble & Chong, 2004; Wang et al., 2009; Yamin & Andersson, 2011), and so neglect the antecedents to intra- and inter-organizational network relationships. In sum, the literature on subsidiary R&D is either fully concerned with relational embeddedness or with organizational issues. It is our contention that these two perspectives are complementary yet only partial explanations of the same phenomena. To fill this gap in the literature we seek to develop a model that includes the effects of the interaction of all these elements. Hence, this study seeks to provide fresh answers to the traditional questions of: (1) Why do the subsidiaries of the same firm in different locations develop different competences? And, (2) why do the subsidiaries of different firms in the same location develop different competences?

By taking a multiple mediating approach, we provide empirical evidence for the interaction of these elements based on a survey of 111 foreign-owned subsidiaries in Spain. Because the concept of dual embeddedness is still at an early stage of development, we have adopted the partial least square (PLS) approach to structural equation modelling, since it is better suited to predictive research models and theory building, that is, to exploratory studies (Chin, 2010). Our results indicate that favourable corporate-level factors and country-level factors are necessary but insufficient conditions to develop subsidiary R&D-contributing roles, as has been argued in the traditional literature. We find that performing a competence-creating mandate depends not only on corporate and country-level factors, but also on the subsidiary's simultaneous embeddedness in the internal and external networks. Hence, the main contribution of this paper is the development of a model that sheds light on how corporate- and country-level factors interact with internal and external subsidiary embeddedness in the configuration of high-contributing R&D roles. By bringing together concepts and insights from the literature on subsidiary R&D roles and network-based view, we take the analysis one step further than previous studies and uncover several mediations determining the strength of internal and external influences. In that sense, this paper responds to the recent call from Foss & Pedersen (2004) for an

examination of the causal mechanisms and underlying factors that mediate between knowledge processes and other organizational arrangements.

The paper is organized as follows: the next section provides a brief overview of different perspectives on the contribution made by subsidiaries to the firm-competitive advantage. The third section develops the theoretical argument and presents hypotheses that might serve to disentangle the confounding effects of country- and corporate-level factors and dual embeddedness on R&D roles. A description of the data and research methods and an evaluation of the model employed follow in the fourth section. Then, the findings of the multiple mediation analysis are presented before discussing the results in the sixth section. The paper concludes with a presentation of the main contributions and a discussion of the implications and directions for future research.

2. THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

2.1. THE MEDIATING EFFECT OF THE EXTERNAL MNC NETWORK

Grounded in the industrial-organizational perspective, environmental factors are assumed to contribute to the development of MNC subsidiary competences and, thus, to determine subsidiary roles. Birkinshaw & Hood (1998) referred to these as factors of '*local environment determinism'* and considered the role of the subsidiary as *'a function of the constraints and opportunities found in the local market'*. Furthermore, this host country determinism can also be applied to subsidiary roles in R&D. For example, Pearce (1999) developed a typology for subsidiary-level R&D and considered the role of each subsidiary as being essentially determined by *'the attributes of the location in which it is sited'*. Additionally, Cantwell & Mudambi (2005) allude to '*location determinants'* to explain that R&D development is conditioned by the '*characteristics of the location in which the subsidiary is located'* in terms of quality and resource conditions.

The chief argument underpinning this environment determinism is that, in essence, each subsidiary operates under a unique set of conditions, as defined by Porter's (1990) diamond model, i.e. customers, competitors, suppliers and factor endowments, which constrains or determines a firm's competitiveness. For instance, the level of competition in the environment puts pressure on firms to be innovative and to upgrade their competencies in order to outperform their competitors (Holm, Malmberg, & Sölvell, 2003). Similarly, consumer discernment and sophistication pushes MNC units to develop new practices and competences to satisfy demanding customers (Beise, 2004). Specialized suppliers, too, may stimulate competence development in firms that agglomerate in a particular location (Myles Shaver & Flyer, 2000).

Although Porter's (1990) model focuses on a '*firm's location advantage in leading-edge clusters*', its four main dimensions are applicable when assessing the dynamism of the subsidiary's external environment (Birkinshaw & Hood, 1998). In this sense, Frost et al. (2002) examined the influence of a

host country's 'diamond strength' to predict the emergence of subsidiary centres of excellence, but they found no significant relationship between them. Likewise, Foss & Pedersen (2002) used the elements of Porter's diamond model to assess the transferability of knowledge sourced from subsidiaries' local environments and found 'cluster-based knowledge' the least interchangeable among a corporation's units. Moreover, Holm et al. (2005) were unable to verify a relationship between the dimensions of a competitive environment and a subsidiary's impact on MNC competence development, except through external network relationships. All in all, these inconclusive insights reveal the need to identify a catalyst of the effects of country-level factors on subsidiary R&D roles. Therefore, to understand the phenomenon it is necessary to consider not only location issues at the country-level but also location interactions as the main device for leveraging environmental factors.

Subsidiaries develop their competences by active participation in relationships with the local 'community of practice' (Frost et al., 2002); that is, by embedding in long-lasting network relationships with host-country actors such as customers, suppliers, universities, science centres and the authorities (Andersson et al., 2002). This is what is understood as external embeddedness from a network-based view. The underlying idea is that the maintenance of strong, trustful and cooperative ties with local actors can potentially establish the basis for learning, generating and transferring knowledge beyond the boundaries of the firm (Andersson, 2003; Uzzi & Lancaster, 2003), where this knowledge is, in turn, the basis for developing technological competencies to undertake innovative activities (Figueiredo, 2011). In this way a subsidiary can develop its technological competencies which, when transferred to other units, help improve the overall level of competencies within the MNC firm (Andersson, Forsgren, & Pedersen, 2001; Yamin & Andersson, 2011). In this sense, Andersson et al. (2002) found that external technical embeddedness, which is the type of embeddedness associated with R&D activities, has a positive impact on both the subsidiary's expected performance and its role in the development of products and production processes in the MNC.

These insights reveal that the reason why some subsidiaries achieve better innovative performance than others, even though they operate in the same environment, can be explained by the breadth (the diversity of agents) and the depth (commitment and trust) of subsidiary linkages with local partnerships. Therefore, it would seem that improvements in a subsidiary's R&D role depend upon their effective integration into the local host country's environment and not just on their siting their activities in a munificent location (Cantwell, 2009). The potential of environmental characteristics as a source of competitiveness lies in the awareness of subsidiary to exploit the welfare effects of the country's science base via a certain degree of embeddedness.

In sum, while previous studies have considered the evolution in the R&D role as being driven by favourable and unfavourable environment conditions (Benito, Grøgaard, & Narula, 2003; Frost, 2001), we relate location advantages to the interaction with actors in the external environment (see Figure 1). In line with Rugman & Verbeke (2001), we are especially interested in the environment characteristics that are 'endogenized' by subsidiaries to enhance their knowledge basis for innovation. Thus, we argue

that the degree of local embeddedness reflects how well the subsidiary takes advantage of challenging competition, demand market conditions, factor endowments, suppliers and related industries to contribute to the MNC's overall competences. Thus, the effects of favourable local conditions can be intensified through enhanced degrees of local embeddedness. Hence we posit:

Hypothesis 1: The greater the mediating effect of external embeddedness, the stronger is the impact of country-level factors on the subsidiary's R&D-contributing role.

2.2. THE MEDIATING EFFECT OF INTERNAL MNC NETWORK

The resource-based view has largely guided inquiries into the development of a subsidiary's resources and capabilities and the subsequent evolution and recognition of its strategic role. From this perspective, traditional research has demonstrated the potential of subsidiary units to achieve contributory roles through their entrepreneurial efforts, i.e. subsidiary initiatives enabling them to expand their value-adding activities, markets or responsibilities. These actions along with the leadership of the subsidiary's managers ensure that the resources and capabilities developed gain the recognition of headquarters. (e.g. Birkinshaw, 1997; Birkinshaw et al., 1998; Cantwell & Mudambi, 2005; Cavanagh & Freeman, 2012; Dörrenbächer & Gammelgaard, 2006; Pearce, 1999; Roth & Morrison, 1992; Scott, Gibbons, & Coughlan, 2010).

Specifically, subsidiary entrepreneurship includes, among other aspects, efforts to develop new products, improvements in production processes and proactive subsidiary bids for internal corporate investments (Verbeke & Yuan, 2013). In fact, initiative and risk-taking behaviour thrive in a true entrepreneurial culture (Barringer & Bluedorn, 1999; Covin & Slevin, 1989), which is shaped by either parent-induced or subsidiary-driven actions (Kuratko, Montagno, & Hornsby, 1990). In the case of subsidiary initiative, it has been postulated in the literature that it can positively influence a subsidiary's R&D-contributing role (e.g. Birkinshaw, 1996; Birkinshaw et al., 1998; Cantwell & Mudambi, 2005; Pearce, 1999; Scott et al., 2010; Taggart, 1996; Young & Tavares, 2004); yet, in the absence of specific initiatives, a subsidiary's entrepreneurial culture can still have a positive impact on the development of distinctive capabilities. Indeed, Birkinshaw et al. (1998) considered initiatives to be particular manifestations of an entrepreneurial atmosphere and classed them as a separate dimension.

Moreover, the leadership provided by a subsidiary's top management is also expected to have a direct influence on its R&D-contributing role, not only by providing direction and by fostering the entrepreneurial drive conducive to initiative of the subsidiary's employees (Ghoshal & Bartlett, 1994), but also by championing and sponsoring the assignment of new international responsibilities or mandates to the subsidiary (Birkinshaw, 1997; Birkinshaw et al., 1998). For example, Cantwell & Mudambi (2005) state that gaining a competence-creating mandate requires, among other aspects, the ability of a subsidiary's managers to develop and exercise a 'voice' in the wider corporate group. Ling, Floyd, & Baldridge (2005) support this view by stressing the effect of quality relationships between

sellers and targeted top managers in 'issue selling'. Also, Birkinshaw & Hood (1998) noted the importance of a strong track record and the credibility of subsidiary management in charter extension processes. Indeed, Dörrenbächer & Gammelgaard (2011) document the value of bargaining power in negotiations between headquarters and subsidiaries in terms of the strategic development of the latter. All in all, a subsidiary's bargaining power is determined by the subsidiary's leadership, which is ultimately responsible for ensuring parent company recognition (Ambos et al., 2010).

Yet, headquarters might either support the further development of a subsidiary's aspirations or it might threaten to undermine subsidiary entrepreneurship. Therefore, subsidiary initiative has to learn to conform to the 'corporate immune system' (Birkinshaw & Ridderstråle, 1999) and so if the affiliate wants to be recognised and rewarded by having its mandate upgraded, it needs to operate in line with the 'dominant logic' of the corporate organization (Bettis & Prahalad, 1995; Prahalad & Bettis, 1986). Consequently, subsidiary initiative has to be expressed within a corporate context that is shaped to a very large degree by headquarters. Hence, according to traditional approaches, corporate-level factors affecting a subsidiary's R&D-contributing role include not only subsidiary leeway but also the parent company's authority.

All these subsidiary strategic role drivers have recently been expanded by internal network-based research, which highlights the interdependence of the internal corporate actors in developing competencies and creating competitive advantage through the building of close and trustful ties within the MNC. A subsidiary's internal embeddedness also affects the organizational scope of subsidiary leeway and innovation (Ciabuschi et al., 2011; Garcia-Pont et al., 2009; Michailova & Mustaffa, 2012). For example, Venaik, Midgley, & Devinney (2005) support the importance of networking and autonomy in encouraging greater innovation and competitive advantage within MNCs. Gnyawali, Singal, & Mu (2009) argue that internal network relationships boost a subsidiary's entrepreneurship. Andersson et al. (2007) conclude that the more valuable a subsidiary's initiatives are to its peer subsidiaries within the MNC network, the more its influence over them will increase. Furthermore, the stronger the linkages that a subsidiary builds with its partners within the subsidiary's internal network, the greater the position of power it will achieve (Young & Tavares, 2004).

However, subsidiaries are not able to increase their influence or central position through initiatives alone, unless they are able to gain headquarters' recognition (Ambos et al., 2010). Thus, drawing on Ambos et al.'s (2010) work, we consider internal embeddedness as being positively related to a subsidiary's strategic importance as a competence provider to the corporation, thus motivating headquarters involvement in the development of subsidiary innovation (Ciabuschi et al., 2011). From a managerial perspective, if subsidiary managers can build good and trusting relations with their counterparts in head office and in their sister affiliates, then they can reinforce internal cooperative ties, increase their visibility and direct the parent company's attention to particular issues (Bouquet & Birkinshaw, 2008; Dutton, Ashford, O'Neill, & Lawrence, 2001).

Consequently, the building of a closely knit internal network is an important issue in the development of a subsidiary's R&D roles, as it provides the basis for leveraging subsidiary corporate-level factors and for exploiting the knowledge and capability dependency of its sister affiliates. Even though a subsidiary displays a strong entrepreneurial culture, undertakes risky initiatives or has powerful leaders in positions of command, these factors may all fall on deaf ears if it is not well connected with the rest of the MNC's units. The reason for this is that internal network linkages are the channel via which subsidiary knowledge is made available to the rest of the MNC (Adenfelt & Lagerström, 2006). This in turn influences the internal strategic context for decision making in an MNC (Garcia-Pont et al., 2009) and, thus, affects decisions regarding which subsidiaries should be allocated R&D mandates. Hence:

Hypothesis 2: The greater the mediating effect of internal embeddedness, the stronger is the impact of corporate-level factors on the subsidiary's R&D-contributing role.

2.3. THE MEDIATING EFFECT OF DOUBLE-NETWORK EMBEDDEDNESS: INTERNAL AND EXTERNAL NETWORKS

Subsidiaries can develop distinctive capabilities by combining host-country endowments with the resources and capabilities available within the MNC (Almeida & Phene, 2004; Cantwell, 2009; Figueiredo, 2011; Frost et al., 2002; Mudambi & Swift, 2011). Therefore, subsidiaries find themselves immersed at the same time in different external and internal contexts in which they build a variety of network ties, which give them the potential to contribute to the innovative capacity of the overall firm (Collinson & Wang, 2012). This idea of dual embeddedness allows subsidiaries to gain access to knowledge from different sources and then to reverse knowledge flows to their internal and external counterparts (Tallman & Chacar, 2011). This means that subsidiaries sit at the nexus of multiple internal and external networks (Collinson & Wang, 2012) that are preceded respectively by a number of corporate- and country-level factors, as described in the two previous sections.

Moreover, a subsidiary can be embedded in various manners, and to different degrees, in internal and external networks (Dörrenbächer & Gammelgaard, 2010). Differences in the variety of interactions and the quality of the linkages developed by a subsidiary lead to differences in levels of knowledge absorption, creation and sharing, and hence to varying levels of contribution to the whole MNC (Andersson et al., 2002; Figueiredo, 2011; Giroud & Scott-Kennel, 2009; Santangelo, 2009). The more advanced R&D-contributing roles are generally associated with sourcing of knowledge abroad which is leveraged by a subsidiary's business relationships with external partners (Andersson & Forsgren, 2000; Andersson, 2003). Increasing such external network linkages is likely to enhance the expected degree of a subsidiary's contribution to that of competence development within the MNC as a whole (Andersson et al., 2002; 2007) and, thus, enhance the subsidiary's power position because of the knowledge dependency of other parts of the MNC (Mudambi & Navarra, 2004). In this context, it is expected that for a subsidiary to gain access to new knowledge it will have to engage more intensively with local partners so as to be rewarded with a competence-creating mandate. However, subsidiary R&D-

contributing role consolidation can only really be culminated when explicitly acknowledged by corporate headquarters. If a subsidiary's capabilities are not valued, its strategic role will not be recognized and, therefore, a competence-creating mandate will not be assigned (Birkinshaw & Hood, 1998). In this second part of the process, a subsidiary must use its connectivity within the MNC network (Meyer et al., 2011). After accessing local external knowledge, the subsidiary must be able to transfer it internally within the firm so as to gain recognition and to be deemed important for the whole MNC. It is argued that increasing intra-organizational knowledge exchange between the focal subsidiary and other units of the MNC is likely to boost subsidiary visibility within the MNC (Bouquet & Birkinshaw, 2008), attract headquarters attention (Ambos et al., 2010) and increase a subsidiary's influence over head office's decision making in its own favour (Mudambi & Navarra, 2004).

A counter argument to the above analysis is that an inverse relationship exists between internal and external embeddedness. According to the institutional theory, dual embeddedness means that the subsidiary is subject to institutional pressures brought to bear by the host country, on the one hand, and by the home context, via its parent MNC, on the other (Forsgren et al., 2005). This is consistent with the integration–responsiveness framework developed by Bartlett & Ghoshal (1988): a subsidiary must adapt its strategies and organizational practices to local contexts, as well as to the institutional constraints imposed by its home country (Meyer et al., 2011). This balance is often difficult to achieve. Furthermore, the resource constraints faced by the subsidiary have opportunity costs in terms of adapting to the external and the internal institutional environment. Limited resources mean that a subsidiary often experiences a trade-off between external and internal embeddedness, which may result in two situations.

First, a high degree of external embeddededness may lead a subsidiary to develop context specific capabilities, which are not readily applicable in other MNC units (Andersson, Forsgren, & Holm, 2001; Forsgren, Johanson, & Sharma, 2000). Thus, the subsidiary becomes geographically isolated in the MNC network, diminishing its level of contribution to the corporate. Andersson et al. (2007) reported that externally embedded subsidiaries can provide access to a variety of competencies, but it might also reduce the subsidiaries' motivation to contribute to the overall performance of the MNC. Second, a high degree of internal embeddedness may lead subsidiaries to become heavily dependent for their resources on other parts of the MNC at the expense of sourcing new knowledge through channels of external embeddedness (Andersson et al., 2007). In this case, the subsidiary becomes a receptive unit performing a competence-exploiting mandate.

Consequently, in order to gain a high-contributing R&D role a subsidiary must be not only 'externally embedded', operating as an independent actor in its local environment where it establishes relationships so as to learn and assimilate knowledge from the host country environment (Andersson et al., 2002), but also 'internally embedded', integrating itself in the MNC network to transfer its knowledge to the parent company and sister affiliates, insofar as subsidiaries are dependent on the strategic allocation of resources and mandates within the MNC (Meyer et al., 2011). The learning effects of external

embeddedness need a certain degree of internal embeddedness so that they might be converted in contributions to the competence repositories of the entire MNC. Integrating this mediation role of internal embeddedness with that of external embeddedness generates a three-path mediation model (see Figure 1).

As a result, dual embeddedness mediates sequentially the relationship between country-level factors and a subsidiary's R&D-contributing role. In other words, the country-level factors impact on its external embeddedness and this in turn influences a subsidiary's R&D-contributing role through its internal embeddedness, which finally permits the focal subsidiary to improve its competitive position within the MNC. Thus:

Hypothesis 3: The greater the sequential mediating effect of the external and internal embeddedness, the stronger is the impact of country-level factors on the subsidiary's R&D-contributing role.

3. METHODS

3.1. QUESTIONNAIRE AND DATA

Target population and sampling

The population of this study consists of foreign-owned subsidiaries with productive activity located in Spain[i]. In the absence of registers or directories of foreign-owned subsidiaries undertaking productive activity in Spain, the first stage involved the construction of the sample frame using data assembled from the annual directory of firms compiled by the Spanish Industrial Journal, *Fomento de la producción,* and the data base Analysis System of Iberian Balances (SABI) compiled by *Informa*. Both databases monitor more than 200,000 Spanish companies based on information contained in the Commercial Registries, thus covering more than 95% of the existing population.

We narrowed the companies down by defining foreign-owned subsidiaries as local affiliates whose parent companies held at least 51 percent of their ownership. After correcting for any discrepancies, inaccuracies or out-dated information through the triangulation of the data with other sources (including industry publications, company reports, newspaper articles, etc.), and excluding cases with conflicting ownership information and non-active establishments, a census of 1,072 industrial foreign-owned firms were identified in Spain.

Data collection and respondents

The second stage involved the mailing of the CEOs of the aforementioned 1,072 subsidiaries. The CEO was selected as our target respondent on the basis of their assumed knowledge of the firm's strategic profile (Frost et al., 2002). In order to improve the response rate a specific procedure/protocol

encompassing the main techniques and steps recommended in the literature was adopted: 1) a personalized request for participation was made in a covering letter adreced to the CEOs, which outlined the aims and nature of the study, its usefulness for subsidiary managers and the confidentiality of the respondents (Harzing, 1999; Harzing & Noorderhaven, 2006); 2) the official stationery of the university and sponsor (Dillman, 1978), in this case the Ministry of Industry of the Spanish Government was used to increase trust and legitimacy; 3) finally, suitably spaced mailings, including a telephone follow-up to survey non-respondents were undertaken (Dillman, 2000; Fowler, 1993).

The first survey mailing was sent out in June 2008, followed up with a reminder and a replacement questionnaire (where necessary) in September 2008. Likewise, a large call round was conducted after every mailing. All in all, a total of 125 questionnaires were received, which is within the normal range for surveys of MNC subsidiaries (Harzing, 1997) with high-level executives as respondents (Harzing & Noorderhaven, 2006).

The usable responses were reduced to 111, either because the subsidiary reported no R&D activity at all or for reasons of missing data, giving an effective response rate of 10.35%. Non-response bias was checked by comparing the number of employees and the industry (based on two-digit NACE classification) of the respondent subsidiaries with those of the non-respondents. The t-statistic was used to test the non-response bias for the number of employees (in log scale), as the normally distributed quantitative variable, and the Chi-square test for the economic sector, as the nominal variable. No significant differences were found between respondents and non-respondents (p-value=0.594; p-value=0.377, respectively).

The final sample covers more than 20 different types of manufacturing industry (based on two-digit NACE classification), with subsidiaries from the chemical (18.2%), pharmaceutical (12.7%) and metal products, machinery and equipment (10.0%) industries dominating the sample. Within the sample, subsidiaries vary considerably in size (ranging from 5 to 7,406 employees with an average of 394), age (ranging from 2 to 118 years with an average of 35), internationalization (ranging from 0 to 96% foreign sales with an average of 28.34%) and R&D budgets (ranging from €0.02 million to €41.33 million with an average of €3.92 million). Parent company nationality is also varied (with 18 nationalities being represented): 73.64% are of European origin, 20.00% North American, and 5.45% Asian. This guarantees a diverse sample in terms of industry, size, age and internationalization, and hence we minimize the number of sources of extraneous variance and systematic bias.

Survey instrument

The questionnaire survey was designed following an extensive and thorough review of the literature on International Business to provide evidence on a wide range of aspects associated with differentiated subsidiary roles. This review formed the basis for defining the study's core constructs, for choosing existing scales or constructing new ones where necessary and for wording specific items.

The draft questionnaire was subsequently pilot-tested and improved after performing various pretests with experts from both the academic and business worlds. In the case of the former, feedback from three researchers working in the field led to the modification/elimination of some of the initial survey items and the introduction of others, so as to minimize sources of possible bias and to guarantee that the indicators actually captured the constructs for which they were designed. In the case of the latter, feedback from three subsidiary managing directors resulted in minor changes to ambiguous questions and phrasings so as to enhance comprehensibility. The final questionnaire had a total of 256 variables measuring a variety of topics concerning the configuration of differential subsidiary roles. The present study specifically draws on measures of external embeddedness, internal embeddedness and R&D functional area.

3.2. MEASURES

The measures used in this paper, in line with previous studies, are based on elements captured from an initial literature review, while we extend prior operationalizations by purposely customizing them to this specific research project. Table 1 provides a summary of the constructs used.

Country-level factors

The configuration of the environment was measured using eight items, reflecting the subsidiary manager's perception of different aspects of the host country on a 7-point-scale (anchored as 1=not important at all, 7=very important). Building on the main elements of Porter's (1990) diamond model and the scale developed by Frost et al. (1998), respondents were asked to assess the business environment in which they compete in relation to four dimensions: 'level of competition'; 'demand market conditions'; 'factor conditions'; and availability of 'supplier and related industries' (see Table 1). In turn, these four dimensions are each captured by two specific items. Based on the assumption that the country diamond might be unbalanced because one element is much weaker, or much stronger, than the others (Asmussen et al., 2009), we specified this measure as a reflective first-order, formative second-order construct.

Corporate-level factors

The corporate-level variable was constructed from nine questionnaire items specified as statements to which managers indicated agreement on a 7-point-scale (anchored as 1=strongly disagree, 7=strongly agree). This set of measures was assembled from multiple contributions in order to capture not only subsidiary choices but also headquarters perceived stance towards them. Initially, this variable was modelled as a single first-order factor; however, the number of items fell in the course of Factor Analysis in the PLS, suggesting the existence of underlying dimensions. Finally, three dimensions were found to load strongly on the main construct.

The first dimension of this scale included three items capturing subsidiary leadership based on Birkinshaw et al.'s (1998) measure. The second dimension comprised four items for assessing subsidiary initiative: the first item evaluated the degree of legitimacy conferred on the subsidiary managers' initiatives within the MNC (Roth & Morrison, 1992). The following two items captured the desire by subsidiary management to enhance local value-added and to develop their competences beyond the mandate assigned them (Birkinshaw, 1997). The third dimension embraces two items reflecting risk-taking encouragement from headquarters and subsidiary proactiveness, inspired by the most extensively used operationalization of entrepreneurial orientation (Covin & Slevin, 1989; Miller & Friesen, 1982; Miller, 1983). Finally, this measure was specified as a reflective-reflective second-order construct.

Dual-embeddedness

Internal and external technical embeddedness were captured using ten indicators altogether. First, as regards the 'breadth' of subsidiary ties, respondents indicated the importance of interaction with different types of agent (either local actors or corporate counterparts) for the development of the subsidiary's R&D competences on a 7-point scale (ranging from 1=not important at all, to 7=very important). In the external embeddedness category, as Asmussen et al. (2009) suggest, we use the network links specific to the technical environment consisting of labour with industry-specific skills, local research institutions, and related industries using similar technologies, thereby providing synergies and technology spillovers (three items). In the internal embeddedness category the items cover knowledge sourcing linked to the corporate agents, that is to say, the focal subsidiary, the headquarters and the peer subsidiary units (three items) (Figueiredo, 2011).

Second, the strength of a subsidiary's network relationships was captured on a 5-point scale (where 1= used rarely, to 5=used very often) by asking respondents about their 'depth' of engagement in knowledge-based linkages, since these require high degrees of commitment, trust and reciprocity and constitute embodiments of embeddedness (Dacin, Ventresca, & Beal, 1999). In the case of external embeddedness, we included one item for outsourcing and another for alliances/cooperation linkages (Manolopoulos, Dimitratos, Young, & Lioukas, 2009); while for internal embeddedness, we refer to the mode in which knowledge is developed, either by leveraging the experience of other units or through joint collaborative efforts (two items) (Björkman, Barner-Rasmussen, & Li, 2004; Minbaeva, Pedersen, Björkman, Fey, & Park, 2003; Monteiro, Arvidsson, & Birkinshaw, 2008).

The measurement of the internal embeddedness construct mirrored that of external embeddedness. Both variables were specified as reflective second-order constructs, each loading strongly on two dimensions that fit the concepts of breadth (diversity of agents) and depth (commitment and trust) of the subsidiary's patterns of contacts with its partners as proposed by Andersson et al. (2002).

Subsidiary R&D-contributing roles

The subsidiary R&D-contributing role construct comprises six items measuring the level of competences in different R&D activities performed by the subsidiary and recognized by the entire MNC but from the subsidiary manager's perspective on a 7-point scale (where 1=weak competence recognized, 1=very strong competence recognized). Our aim here, in keeping with Birkinshaw & Hood (1998), is to focus on the subsidiary's charter and its underlying capabilities. This variable, specified as a first-order construct, captures the subsidiary's recognized capabilities for its R&D competence-creating role. As such, it is an adaptation of the measure of a firm's technological capabilities as proposed by Iammarino, Padilla-Perez, & Von Tunzelmann (2008), but it focuses solely on the advanced category of capabilities as descriptors of a competence-creating role – i.e. cutting-edge research (basic research); applied research into new product generations; research into new materials and new specifications; development of new products, designs and prototypes; own-design manufacturing; and major improvements to machinery, equipment and processes.

Control variables

In order to control for effects other than those hypothesised, we used several control variables which we drew from the previous literature and used to control for its influence on knowledge transfer and mandate allocation. First, we introduced 'subsidiary size' measured as the number of employees in the focal subsidiary (Foss & Pedersen, 2002; Bouquet & Birkinshaw, 2008). Second, we controlled for 'subsidiary age' computed as the number of years the subsidiary had been in operation (Håkansson & Snehota, 1995; Yamin & Andersson, 2011). Third, following Rugman & Verbeke's (2001; 2004) regionalization theory, we entered a dummy variable ('home region') for similar versus different locations with respect to the continent on which the subsidiary is located, in this case the EU (1=EU firms, 0=non EU firms). Fourth, to ensure that 'entry mode' is not driving the results, we used a dummy variable as control for the formation of the subsidiary (1=greenfield investments and 0=otherwise), (Belderbos, 2003; Björkman et al., 2004). Fifth, we controlled for 'industry effects' (Gupta & Govindarajan, 2000; Frost et al., 2002). Based on two-digit NACE classification subsequently collapsed into OECD technology and knowledge-intensity industry classifications, we created a dummy variable that takes the value of 1 if the subsidiary was qualified as high-tech or medium-high-tech, and 0 otherwise. Finally, to guard against incorrect conclusions, we also estimated two non-hypothesized paths between 'country-level factors' and 'internal embeddedness' and between 'corporate-level factors' and 'external embeddedness'. Thus, in these specific relationships, the independent variables act as controls.

3.3. DATA ANALYSIS TECHNIQUE

A partial least square (PLS) approach to structural equation modelling (Chin, 1995; Chin, 1998a; Chin, 1998b; Wold, 1982) was used to test the hypotheses, specifically we used SmartPLS 2.0 software (Ringle, Wende, & Will, 2005). For our analysis this technique is preferable for the following reasons.

First, structural equation modelling particularly fits this study since many if not most of the key concepts are not directly observable. Structural equation modelling combines the econometric perspective focusing on prediction and the psychometric perspective focusing on measuring latent, unobserved variables with multiple observed indicators (Chin, 1998a). Second, dual embeddedness is still at an early stage of development, therefore the regression based approach of PLS is more appropriate than covariance-based models, since it is better suited to predictive research models and theory building, that is, exploratory studies (Chin, 2010) such as the one reported here. Third, the mathematical algorithm underlying PLS also makes it suitable for this research, which is determined by a non-normal distribution and a relatively small sample size, making PLS results robust to skewed data (Ringle, Götz, Wetzels, & Wilson, 2009; Wilden, Gudergan, Nielsen, & Lings, 2013). Fourth, the research model contains both reflective and formative constructs, to which PLS is particularly suited (Diamantopoulos & Winklhofer, 2001; Jarvis et al., 2003). Fifth, four of the five main constructs are second-order constructs measured though eleven dimensions and interwoven with a set of mediations. Such a complex model specification corroborates the suitability of PLS, given its robustness in dealing with complex models of limited sample size (Reinartz et al., 2009). Consequently, here we employed PLS because of its overall suitability to our modelling requirements.

The PLS estimates are reported in two stages following the recommendations of Chin (2001). In the first stage the measurement model is assessed by focusing on the psychometric properties of the scales under study. The second stage provides evidence supporting the theoretical model as exemplified by the construct relationships. Bootstrap percentile confidence intervals (setting the number of bootstrap samples equal to 5000) were constructed to assess the significance of the parameter estimates. This provides extra confidence that the results are not sample specific (Preacher & Hayes, 2004) and has the advantage of being completely distribution free (Chin, 2010).

Psychometric properties of the first-order measurement model

Individual item reliability proved to be optimal for most of the measurements, with item standardized loadings being equal to at least 0.707 (Carmines & Zeller, 1979). The only three loadings under the suggested optimal threshold were retained in the model, since they are over the minimum acceptable value of 0.55 suggested by Falk & Miller (1992). Further, we find all factor loadings to be significant at the 0.01 level (see Table 1). Second, internal consistency reliability was examined through composite reliability (Werts, Linn, & Jöreskog, 1974), which fulfils the same task as Crombach's alpha (Birkinshaw et al., 1998; Furrer, Tjemkes, & Henseler, 2012). However, composite reliability is more suitable for PLS because it does not assume that each indicator makes an equal contribution to the construct (Chin, 1998b). All the latent constructs exceeded the benchmark of 0.7 for exploratory

research suggested by Nunnally (1978) (Table 1). Third, convergent validity demonstrates the unidimensionality of our constructs. The variance in the indicators accounted for, in terms of variance extracted (AVE), exceeds the 0.5 threshold (Fornell & Larcker, 1981), ensuring that each set of indicators represents one and the same underlying construct (Henseler et al., 2009). Finally, all constructs used in this study differ sufficiently from each other, i.e. fulfil discriminant validity. This requirement was inspected using Fornell & Larcker's (1981) criterion, which suggests that the AVE should be greater than the variance between the construct and other constructs in the model (i.e., the squared correlation between two constructs) (see Table 2).

Psychometric properties of second-order measurement model

As the second-order latent variables in the model encompass both reflective and formative constructs, the two-stage approach, also known as the latent variable score method, was adopted (Ringle, Sarstedt, & Straub, 2012; Wetzels, Odekerken-Schroder, & van Oppen, 2009) to specify the hierarchical latent variables.

As with the first-order measurement model, the reliability and validity of the item measures clearly exceed the minimum requirements for adequate measurement models (0.70 for individual reliability and construct reliability, and 0.50 for average variance extracted) (Table 3).. Moreover, comparison of these reliabilities with inter-construct correlations demonstrates adequate discriminant validity (Table 4). For the formative second-order construct 'country-level factors' pychometric properties are interpreted using weights and their statistical significance, which provide information about how each indicator contributes to the respective construct. Additionally, a inspection of the variance inflation factor (VIF) using SPSS 20.0 for Windows does not raise any concerns about multicollinearity (see Table 3), as it is well below the cut-off value of 5 (Kleinbaum, Kupper, & Muller, 1988). Taken together, these results provide sufficient confidence that the measurement model used in this research is reliable and valid.

Common method bias assessment

Common method variance bias was evaluated ex post to check for biases not minimized by the survey design. We took the ad hoc statistical approach suggested by Podsakoff et al. (2003) and adapted for use with PLS by Liang, Saraf, Hu, & Xue (2007). Specifically, a latent 'method' factor was added to the structural model. This method factor included all the indicators of the principal constructs. Then, following Williams, Edwards, & Vandenberg (2003), we examined the statistical significance of factor loadings of the method factor and compared the variances of each observed indicator explained by its hypothesized construct and the method factor. As shown in Table 5, the indicators' loadings on the hypothesised constructs are all significant, whereas, with only one exception, all of their loadings on the method factor are non-significant. The variance in the indicators, explained by their hypothesised constructs (on average 0.6413), are substantially larger than those explained by the method factor (on average 0.0165). The above results show that the method did not contribute substantively to the

variances in indicators and, therefore, common method bias was unlikely to be a serious concern for this study.

Structural model evaluation

Structural model evaluation in PLS relies on measures indicating the model's predictive power (Tenenhaus, Esposito Vinzi, Chatelin, & Lauro, 2005). Table 6 shows that the R^2 value for the three endogenous variables in the model greatly exceeds the minimum value of 0.1 recommended by Falk & Miller (1992). Furthermore, the theoretical model proposed explains more than 50% of the variance of the final endogenous variable predicted, i.e. 'subsidiary R&D-contributing role' (R^2=0.58), which can be rated as a 'moderate-substantial' predictive capacity according to Chin's (1998) benchmark. Also, the Stone-Geisser Q^2 statistic (Geisser, 1974; Stone, 1974) is higher than zero for the three endogenous constructs, suggesting that the model has predictive relevance. Finally, structural path coefficients and, in particular, their significance and size demonstrated that 'subsidiary R&D-contributing role' is directly and positively influenced by both 'internal' and 'external embeddedness', which in turn, are directly and positively influenced by the 'corporate-level factors' and 'country-level factors' respectively, which points to the existence of a possible mediations. These paths are represented in Figure 2.

The control variables fall into two sets. The first set comprises the standard, subsidiary-specific variables that control for firm heterogeneity ('subsidiary age', 'subsidiary size', 'home region', 'entry mode' and 'industry effects'). Given the insignificant effects of these control variables we followed the principle of parsimony and excluded them from all further analyses (Berghman, Matthyssens, Streukens, & Vandenbempt, 2013; Scott et al., 2010). The second set is the more relevant from the network-base perspective, and comprises the effect of 'corporate-level factors' on 'external embeddedness' and 'country-level factors' on 'internal embeddedness'. In both cases, no significant effect was found. Nevertheless, given that the confidence interval of the second control is very close to zero, we retained it in the model. In the light of these findings, to fully understand the pattern of dual embeddedness in the R&D subsidiary roles, a formal mediation test has to be conducted.

Post hoc assessment of mediating effects

The theoretical model proposed involves multiple mediation hypotheses and requires testing indirect effects either in parallel or linked serially in a cause sequence. For this reason, we applied Hayes' (2012) PROCESS macro in SPSS 20 for testing *serial multiple mediator models* (Hayes, Preacher, & Myers, 2011), not only to decide whether or not an indirect effect exists, but also to tease apart individual mediating effects often attributable to several potential mediators that might overlap in content (see Preacher & Hayes, 2008; West & Aiken, 1997). This method makes it possible to include more than one independent variable, each of which can be tested in a complementary model, and to control simultaneously the non-hypothesized effects of 'corporate-' and 'country-level factors'. In each

model, we chose one of the independent variables (either the 'corporate-level factors' or 'country-level factors') as the primary independent variable to be examined, and treated the other as covariates for that test (c.f. Sun, 2010).

4. RESULTS

The main argument of this paper is that the impact of the classical factors on the configuration of strategic R&D roles, i.e. 'corporate-level factors' and 'country-level factors', is mediated at one and the same time by the 'internal' and 'external embeddedness'. In this sense, Table 7 shows the results of the post hoc assessment of these mediating effects.

First, a model is specified with the 'corporate-level factors' as the independent variable (Model 1 in Table 7) and the 'country-level factors' treated as a covariate. As can be seen, 'corporate-level factors' have a significant total effect on 'subsidiary R&D-contributing role' (β=0.2469**, $CI_{.95}$=[0.0914, 0.4024]). When the mediators (i.e. 'external embeddedness' and 'internal embeddedness') are introduced, the 'corporate-level factors' no longer have a significant direct effect on 'subsidiary R&D-contributing role' (β=0.0841, $CI_{.95}$=[-0.0544, 0.2226]). Further, the total indirect effect is different from zero (β=0.1628; $CI_{.95}$=[0.0758, 0.2839]). An examination of the specific indirect effects indicates that 'internal embeddedness' is the only significant mediator (β=0.1339; $CI_{.95}$=[0.0602, 0.2417]). Still, it may be of interest to examine whether these indirect effects differ significantly. The pairwise contrast of the indirect effects reveals that 'internal embeddedness' is a significantly greater mediator than the other two. The difference between them is -0.1141 and -0.1250. The other two indirect effects through 'external embeddedness' cannot be distinguished in terms of magnitude (the confidence interval of the contrast contains zeros, indicating that the two indirect effects are of a similar magnitude). Therefore, we can affirm that 'internal embeddedness' fully mediates the impact of 'corporate-level' factors on 'subsidiary R&D-contributing role', so H1 is supported.

Second, we examine the model that has 'country-level factors' as the independent variable and 'corporate-level factors' as a covariate (Model 2 in Table 7). In line with these results, country-level factors do have a significant total effect on 'subsidiary R&D-contributing role' (β=0.5069, $CI_{.95}$=[0.3514, 0.6624]) and the total indirect effects are also significant (β=0.2723, $CI_{.95}$=[0.1574, 0.4130]). When the mediators (i.e. 'external embeddedness' and 'internal embeddedness') are introduced, the effect of 'country-level factors' directly on 'subsidiary R&D-contributing role' becomes significantly smaller in size relative to the total effect (β=0.2346, $CI_{.95}$=[0.0715, 0.3977]), but it remains significant at the 95% confidence interval. An examination of the specific indirect effects shows that both indirect effects, through 'external embeddedness' and through 'external-internal embeddedness' in a double-step path, act as mediators, since their 95% confidence interval does not contain zero. In contrast, the specific indirect effect through 'internal embeddedness' does not act as a mediator. The three-way pair wise contrast between them indicates that the indirect effects do not differ significantly, despite the fact that the paths through 'external embeddedness' are significantly different from zero and

although the paths through 'internal embeddedness' are not. '*Such apparent paradoxes can occur when one of the specific indirect effects involved in the contrast is not sufficiently far from zero*' (Preacher & Hayes, 2008), such as 'internal embeddedness' in this study.

Turning therefore to our hypotheses, on the one hand, 'external embeddedness' mediates the influence of country-level factors on the 'subsidiary R&D-contributing role', while on the other hand, 'country-level factors' also impact the 'subsidiary R&D-contributing role' via a double-step mediation comprising 'external embeddedness' causally affecting 'internal embeddedness'. This partially supports H2 and H3, since both mediated and direct effects coexist and point at the same direction, which means that partial mediations but not full mediations exist between 'country-level factors' and 'subsidiary R&D-contributing roles'.

Finally, a particular feature of these findings is that they can be shown to be robust after controlling for the effects of 'corporate-level factors' on 'external embeddedness' and 'country-level factors' on 'internal embeddedness', two indirect effects that were not hypothesised. These results reduce the risk of wrong conclusions being drawn as a consequence of parameter bias due to omitted variables (Judd & Kenny, 1981).

5. DISCUSSION

By adopting a network-based view, this study offers a number of fresh insights into the drivers of the configuration of subsidiary R&D roles. In particular, we have found evidence of underlying factors of the subsidiary R&D-contributing role in the development of the technological base of the whole MNC, which forms part of the competitive advantage of the firm. Our findings are consistent with other studies that have identified country- and corporate-level factors to be the main drivers of strategic R&D roles, albeit not quite in the manner that these prior contributions would have led us to expect.

Our results suggest, first, that the better the condition of the location in which a subsidiary is sited, the better the contribution it can make to technology generation within the MNC. However, this beneficial effect exists because local embeddedness establishes the bases for sharing, learning and generating knowledge beyond the boundaries of the firm. As such, a subsidiary's external embeddedness channels the influence of country-level factors on its R&D-contributing role. This means that a better local environment does not necessarily result in the assignment of greater R&D mandates, unless the subsidiaries themselves engage in technological exploration by strengthening linkages with local agents. This finding supplements our understanding of how local contexts impact subsidiary roles and adds further our knowledge of the factors that the literature recognises under the rubric of 'location advantages' (see e.g. Benito et al., 2003; Dunning, 2000).

Second, corporate-level factors appear to be strongly associated with internal embeddedness, which in turn, serves to boost the recognition of competence-creating mandates among a firm's subsidiaries.

However, our results show that no clear relationship exists between corporate-level factors and a subsidiary's contributing role, except through the channels of internal embeddedness. This finding is contrary to predictions in a number of prior studies conducted from a resource-based view (e.g. Birkinshaw, 1996; Roth & Morrison, 1992) and to supplementary theories of subsidiary evolution (e.g. Birkinshaw & Hood, 1998; Cantwell & Mudambi, 2005; Dörrenbächer & Gammelgaard, 2006). Our interpretation of these differences is that these prior studies, undertaken from an atomistic view of MNC subsidiary units, appear to have neglected internal embeddedness as the means by which corporate-level factors might impact a subsidiary's contributing role. This would seem to demonstrate that traditional approaches are misleading when explaining differences in the various R&D roles of the units of an MNC, since one of the main sources of such differences is the manner in which, and the extent to which, subsidiaries become embedded in the internal and external network linkages for accumulating and sharing knowledge.

Third, because much of the influence of external embeddedness on a subsidiary's R&D-contributing role is conducted through the channels of internal embeddedness, our study confirms the need to consider the impact of dual network embeddedness in determining the role played by subsidiaries as R&D contributors. In contrast to previous studies that identify above all the importance of external embeddedness for a subsidiary's role as a centre of excellence (Andersson & Forsgren, 2000), our study finds that internal embeddedness presents a more markedly positive 'size effect' (Cohen, 1988) on a subsidiary's acknowledged competences. In fact, the greater the effect of external embeddedness on a subsidiary's R&D-contributing role, the stronger is the mediating effect of internal embeddedness.

A possible explanation might be found in the attention-based view (Bouquet & Birkinshaw, 2008). Thus, the greater impact of internal embeddedness may be derived not solely from technological inputs stemming from the corporate context, but also from the underlying organizing principles, systems, and processes that allow the subsidiary to innovate (Almeida & Phene, 2004). Ciabuschi et al. (2011) demonstrate that internal embeddedness attracts headquarters involvement in subsidiary activities and that this can lead to an increased level of competences at the focal subsidiary. An alternative explanation might lie in the resource-dependency theory (Mudambi & Pedersen, 2007). Thus, the subsidiary builds critical linkages with key external actors so as to learn and assimilate knowledge from the host country environment, and wilfully uses corporate linkages in order to control and transfer value-adding resources, especially knowledge, on which the rest of the MNC can draw (Birkinshaw et al., 2005) and which they could not otherwise access (Dörrenbächer & Gammelgaard, 2010). In this situation, a subsidiary's internal embeddedness ensures the dissemination of technological capabilities back to the parent company, so as to manipulate dependencies and exert influence over the allocation of mandates.

A more exhaustive examination of the relationship between the external and internal embeddedness in our model provides further evidence of interest. In line with the findings of the additional analysis in which the line of causality between external and internal embeddedness was reversed, we note the

absence of any significant effect of internal embeddedness on external embeddedness. A plausible explanation for this is that the two operate differently in relation to their impact on a subsidiary's R&D role. For instance, linkages to the MNC may result in redundant competences, since these ties are framed within the same social structure (Almeida & Phene, 2004); in contrast, linkages to entities within the host country might provide knowledge of a more novel, less duplicative nature, relative to the current practices of the MNC (Cantwell & Mudambi, 2005; Yamin & Andersson, 2011). Our results suggest that the line of causality runs from external embeddedness to internal embeddedness because the former requires some degree of internal embeddedness in order to impact fully on the level of competences for which the subsidiary is recognized among the MNC as a whole. This process is of obvious important, as it should help to shed light on how knowledge obtained through external embeddedness can be disseminated to the rest of the firm, and thus increase the subsidiary's contribution to the MNC's overall competitive advantage. Our results also reveal a positive sign in this line of causality, which means that a subsidiary's R&D-contributing role is affected by the growth of embeddedness in both the local environment and in the corporate network. And, here, our model is able to depict the kind of relationships that can occur between them.

This conclusion runs contrary to the predictions of some studies undertaken from the network-based view, which describe the existence of a trade-off between internal and external network embeddedness. They assume that a subsidiary's external embeddedness is positively associated with its competence development but also with its context specificity, a factor that hinders the possibility of transferring knowledge to other corporate units (Andersson et al., 2002). Additionally, they claim a subsidiary has to face institutional pressures from both the host and the home countries, so that the gap between the two institutions is, on occasions, difficult to bridge (Forsgren et al., 2005), which creates a dilemma similar to that found in the tension characterising the integration-responsiveness framework (Meyer et al., 2011). For example, Adenfelt & Lagerström (2006) reported difficulties in handling the dual roles of knowledge development and sharing, which results in a role concerned primarily with the latter at the expense of developing new knowledge, reflecting the respective cost and time requirements of the two activities. This is also discussed conceptually by Forsgren et al. (2000).

Our findings go someway to refuting these previous claims as we provide empirical evidence of the subsidiary's capacity to build on both knowledge networks, at least as far as its competence-creating mandates are concerned. However, these findings can perhaps be reconciled with the previous literature if we consider that the ability to handle dual embeddedness is dependent on a subsidiary's prior stock of knowledge and the role it plays in the corporation. Hence, we would expect subsidiaries presenting an inverse relationship between their internal and external embeddedness not to perform an R&D-contributing role. This line of thinking is also prevalent in the view of the firm as a network of differentiated roles and responsibilities (Ghoshal & Bartlett, 1990).

In this sense, it is a well established postulate of the network-based view, that a subsidiary's contributing role is associated with the sourcing of knowledge abroad, leveraged by the subsidiary's

business relationships with its external partners (Andersson et al., 2002; Andersson, 2003). However, our results reveal the relevance of internal embeddedness to a subsidiary's R&D-contributing role. It is our claim that internal network embeddedness is fundamental to the perceived importance of these competences in the eyes of the parent office, ensuring explicit recognition is obtained from corporate headquarters. If a subsidiary's capabilities are not valued, charter allocation is unlikely and, therefore, it will not be granted a role in which it can contribute to strategy development (Birkinshaw & Hood, 1998). Our findings corroborate that for the second part of the process to be fulfilled, a subsidiary must exploit its connectivity within the MNC network. After accessing external local knowledge, a subsidiary must be able to transfer this knowledge internally within the firm so as to acquire recognition and to be deemed important. This conclusion is consistent with the argument that a high degree of intra-organizational knowledge exchange between the focal subsidiary and the other units of the MNC is likely to boost a subsidiary's visibility within the MNC (Bouquet & Birkinshaw, 2008), attract headquarters attention (Ambos et al., 2010) and increase the subsidiary's influence over the head office's decision-making in its own favour (Mudambi & Navarra, 2004). As such, subsidiaries that fulfil R&D-contributing roles are not only externally embedded, operating as independent actors in their local environment in which they have successfully established relationships, but they are also internally embedded, having integrated themselves into the MNC's network insofar as subsidiaries are dependent on the strategic allocation of resources and mandates within the MNC. Thus, on the basis of our findings, internal and external embeddedness cannot be seen as 'competing' forces; on the contrary, the presence of both forces is imperative, a condition that is attributable to the mediating effects they have on each other.

6. CONCLUSIONS

The main contribution of this paper has been to present a multiple mediating model that sheds light of the origin, underlying factors and causal mechanisms that endow an MNC subsidiary with an R&D-contributing role. Although many typologies have been proposed suggesting that subsidiaries vary greatly in the R&D strategic role they adopt, there is no definitive evidence of the origins of such variations (Brinkinshaw et al., 1998). Hence, we have explored how the MNC's internal corporate context, the host country's external context together with dual embeddedness interact to produce the conditions for heterogeneous subsidiary R&D roles. By bringing together previous insights in the literature examining subsidiary roles and networks, here we have gone one step further and uncovered various mediations that determine the strength of internal and external influences. The present study has shown that (1) internal embeddedness fully mediates the impact of corporate-level factors on subsidiary R&D-contributing roles; (2) external embeddedness partially mediates the impact of country-level factors on subsidiary R&D-contributing roles; and, (3) dual embeddedness (defined as a three-path mediation in which external embeddedness precedes internal embeddedness) also mediates in a sequential manner the relationship between the country-level factors and the subsidiary's R&D-contributing role.

Thus, our results indicate that favourable conditions in the internal and external context may not necessarily result in the enhancement of a subsidiary's R&D-contributing role, unless dual embeddedness is well established. Hence, the achievement of a competence-creating mandate does not follow directly from the strategic importance or the dynamism of corporate- and country-level factors as has traditionally been claimed in the literature. However, these factors do matter in the process, inasmuch as they affect the development of competences in network relationships that, in turn, influence whether a subsidiary can contribute to the development of MNC competences. Here, we should stress the critical role played by internal embeddedness as a channel for transferring knowledge to the rest of the multinational, attracting the attention of headquarters and, thus, having an influence on the allocation of mandates. In the case of the conditions of the internal context we have shown the existence of a significant relationship only when the effect is mediated through engagement in intra-corporate relationships. Furthermore, the potential impact on a subsidiary's R&D-contributing role of each of the contextual and relational dimensions analysed herein cannot be fully comprehended until we have fully accounted for the effect mediated through the channels of internal embeddedness.

7. LIMITATIONS AND FUTURE RESEARCH

The preceding analysis has limitations, which, however, could lead to further research. The first, and most immediately apparent, of these concerns is the specificity of the sample setting. The results reported are derived from a sample of Spanish subsidiaries, which may have constraints regarding the generalizability of these findings to other foreign subsidiaries. Likewise, the country-level factors discussed here refer uniquely to the Spanish environment. Yet, this research is explorative in nature and future confirmatory research would need to analyse broader samples in a variety of settings.

Second, the study has been conducted using a cross-sectional method, so we are unable to demonstrate causality conclusively or to rule out reverse causality altogether. At this exploratory stage, a longitudinal analysis would have needlessly complicated the analysis; yet, clearly, in the future this would constitute an exciting avenue of research.

Third, the analysis considers the subsidiary's contributing role in sole relation to R&D and does not examine marketing, human resources or any other value chain activities that might contribute to firm-specific advantage. Investigating other functions would also mean that other aspects, most notably other types of linkage in the subsidiary network, would have to be taken into consideration (see e.g. Asmussen et al., 2009). Therefore, future research should include a subsidiary's other functional activities as well as its business relationships with its counterparts.

Finally, for reasons of conceptual and analytical stringency, we have limited our measurement of subsidiary embeddedness to a relatively small number of relationship types showing a high degree of commitment, trust and reciprocity (e.g. alliances, outsourcing, collaboration). Future research would need to widen its analysis of the type of linkages scrutinized. In this sense, extra care should be taken in

defining the boundaries of the network under investigation, taking into account that defining such research boundaries is somewhat artificial but nevertheless necessary from an analytical point of view (Nell & Andersson, 2012).

However, despite the aforementioned limitations, this study provides some initial insights as to why the subsidiaries of different corporations located in the same environment, and subsidiaries from the same corporation located in different environments, display a diverse range of competencies and make different contributions to a firm's specific-advantage.

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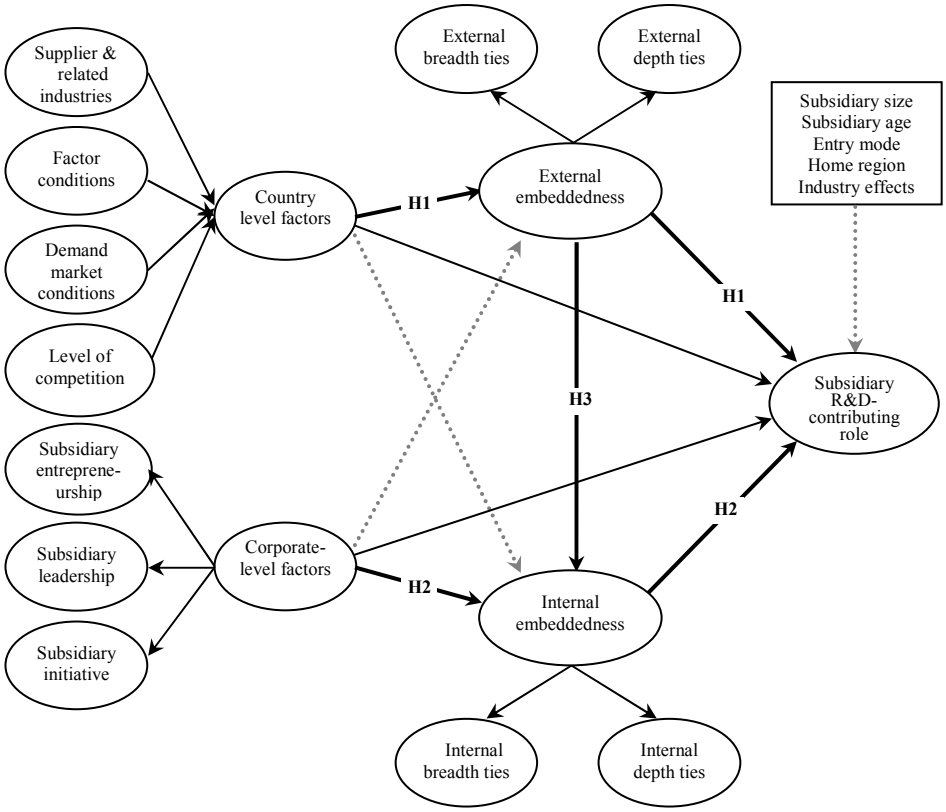
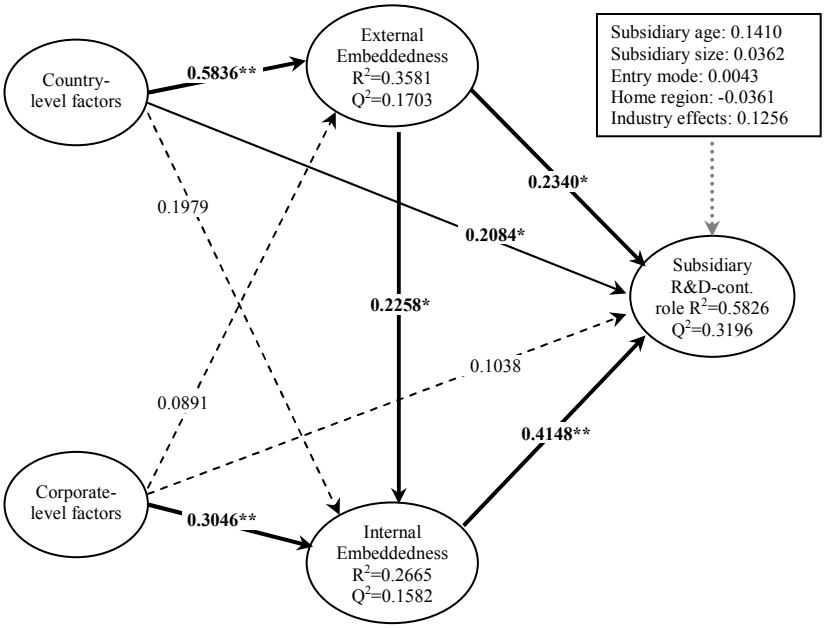
Figure 1. Theoretical model



H1: Country-level factors → External embeddedness → Subsidiary R&D-contributing role
H2: Corporate-level factors → Internal embeddedness → Subsidiary R&D-contributing role
H3: Corporate-level factors → External embeddedness → Internal embeddedness → Subsidiary R&D-contributing role

Figure 2. Path values and variance explained



Note: **$p < 0.01$; *$p < 0.05$ (based on a Student t(4999) distribution, two-tailed test).

H1: Country-level factors → External embeddedness → Subsidiary R&D-contributing role
H2: Corporate-level factors → Internal embeddedness → Subsidiary R&D-contributing role
H3: Corporate-level factors → External embeddedness → Internal embeddedness → Subsidiary R&D-contributing role

Table 1. Operationalization of the constructs. Validation of the first-order measurement model. Reliability and convergent validity

CONSTRUCT / INDICATOR	ITEM	SIGNIFICANCE			CONSTRUCT CONVERGENT	
	Loading	Standard	t-value	Confidence	Composite	AVE
COUNTRY-LEVEL FACTORS [1]						
Level of competition					0.8091	0.6829
• Domestic rivalry	0.7144**	0.0951	7.5136	[0.3755, 0.8695]		
• Firm strategy	0.9249**	0.0275	33.6369	[0.8335, 0.9902]		
Demand market conditions					0.7618	0.6319
• Key customers	0.5593**	0.2012	2.7796	[0.0106, 0.8754]		
• New market niches	0.9752**	0.0709	13.7524	[0.4827, 0.9999]		
Factor conditions					0.8491	0.7381
• Raw material	0.8191**	0.0598	13.7054	[0.5739, 0.9121]		
• Skilled/cheap labour	0.8974**	0.0314	28.5809	[0.7969, 0.9793]		
Supplier and related industries					0.7687	0.6265
• Supply industries	0.7132**	0.1215	5.8691	[0.2097, 0.8949]		
• Complementary & supporting	0.8627**	0.0684	12.6209	[0.6277, 0.9972]		
CORPORATE-LEVEL FACTORS [2]						
Subsidiary entrepreneurship					0.8491	0.7384
• Proactiveness	0.8045**	0.0787	10.2248	[0.4660, 0.9198]		
• HQs risk taking encouragement	0.9109**	0.0352	25.8953	[0.7969, 0.9953]		
Subsidiary initiative					0.8188	0.6026
• Beyond mandate	0.7052**	0.2015	3.4998	[0.0412, 0.9655]		
• Legitimacy	0.7604**	0.1384	5.4935	[0.0990, 0.9592]		
• Enhancement	0.8556**	0.1253	6.8292	[0.1167, 0.9727]		
Subsidiary leadership					0.7532	0.5101
• Decision making participation	0.5572**	0.1996	2.792	[0.0179, 0.9182]		
• Good political relationships	0.7467**	0.1411	5.2936	[0.1945, 0.9784]		
• Managers' track record	0.8138**	0.1129	7.2075	[0.1880, 0.9629]		
EXTERNAL EMBEDDEDNESS						
External breadth ties					0.8745	0.6997
• Local individuals knowledge	0.7748**	0.0572	13.5368	[0.5888, 0.8870]		
• Local firms infrastructure	0.8573**	0.0365	23.4789	[0.7345, 0.9271]		
• Academic Community	0.8738**	0.0223	39.2476	[0.8049, 0.9235]		
External depth ties					0.784	0.6534
• External Outsourcing	0.6376**	0.1327	4.8031	[0.1904, 0.8657]		
• Strategic alliances	0.9488**	0.0299	31.7802	[0.8535, 0.9998]		
INTERNAL EMBEDDEDNESS						
Internal breadth ties					0.8659	0.6837
• Inflows from HQs	0.7593**	0.0577	13.149	[0.5614, 0.8657]		
• Outflows to HQs	0.8905**	0.0184	48.3543	[0.8328, 0.9300]		
• Peer Subsidiaries Interflows	0.8255**	0.0417	19.7756	[0.6830, 0.9055]		
Internal depth ties					0.9347	0.8774
• MNC units experience	0.9368**	0.0185	50.6914	[0.8741, 0.9743]		
• MNC joint collaboration	0.9366**	0.0185	50.5943	[0.8726, 0.9752]		
SUBSIDIARY R&D-CONTRIBUTING					0.9063	0.6184
• Basic research	0.7918**	0.0399	19.8632	[0.6632, 0.8742]		
• Applied research	0.8785**	0.0232	37.8664	[0.8058, 0.9269]		
• Research into new	0.7372**	0.0626	11.7783	[0.5436, 0.8610]		
• Development of new	0.7456**	0.0621	11.9969	[0.5493, 0.8717]		
• Own-design manufacturing	0.8260**	0.0341	24.228	[0.7246, 0.8971]		
• Major improvements to	0.7279**	0.0522	13.9314	[0.5685, 0.8384]		

Note: AVE=Average Variance Extracted; $^{**}p < 0.01$; $^{*}p < 0.05$ (based on a Student t(4999) distribution, two-tailed test).

Table 2. Validation of the first-order measurement model. Discriminant Validity

	1	2	3	4	5	6	7	8	9	10	11	12
1. Level of competition	**0.6829**											
2. Demand market conditions	0.0668	**0.6319**										
3. Subsidiary entrepreneurship	0.0036	0.0342	**0.7384**									
4. External breadth ties	0.2758	0.0551	0.0066	**0.6997**								
5. External depth ties	0.0283	0.0594	0.0217	0.0724	**0.6534**							
6. Factor conditions	0.1094	0.0132	0.0044	0.2131	0.0043	**0.7381**						
7. Subsidiary initiative	0.0039	0.0014	0.2364	0.0050	0.0074	0.0000	**0.6026**					
8. Internal breath ties	0.0595	0.0405	0.1053	0.0880	0.1111	0.0456	0.0197	**0.6837**				
9. Internal depth ties	0.0244	0.0480	0.1324	0.0165	0.1526	0.0643	0.0509	0.3149	**0.8774**			
10. Subsidiary leadership	0.0319	0.0325	0.3106	0.0166	0.0025	0.0015	0.3709	0.0567	0.0441	**0.5101**		
11. Subsidiary R&D-contributing role	0.2039	0.0555	0.0777	0.2474	0.1192	0.1391	0.0405	0.3804	0.2483	0.0555	**0.6184**	
12. Supplier & related industries	0.1845	0.1480	0.0008	0.2418	0.0585	0.1707	0.0052	0.0800	0.0656	0.0235	0.1401	**0.6265**

Note: Diagonal represents the average variance extracted; while below the diagonal the shared variance (squared correlations) is represented.

Table 3. Validation of the second-order measurement model. Reliability and convergent validity

	ITEM		SIGNIFICANCE			CONSTRUCT	CONVERGENT
CONSTRUCT / INDICATOR	**VIF**	**Weights**	**Standard**	**t-value**	**Confidence**	**Composite**	**AVE**
Country-level factors						n.a.	n.a.
• Level of competition	1.290	0.4705**	0.1306	3.6031	[0.1817, 0.6920]		
• Demand market conditions	1.195	0.2080	0.1314	1.5828	[-0.0570, 0.4588]		
• Factor conditions	1.256	0.3499*	0.1426	2.4529	[0.0493, 0.6119]		
• Supplier & relatied industries	1.520	0.3599*	0.1526	2.3585	[0.0583, 0.6642]		
CONSTRUCT / INDICATOR	**Loading**		**Standard**	**t-value**	**Confidence**	**Composite**	**AVE**
Corporate-level factors						0.8718	0.6943
• Subsidiary entrepreneurship	0.8670**		0.0382	22.7146	[0.7401, 0.9655]		
• Subsidiary initiative	0.7838**		0.0768	10.2008	[0.4674, 0.8922]		
• Subsidiary leadership	0.8468**		0.0522	16.2335	[0.6362, 0.9260]		
External embeddedness						0.7695	0.6284
• External breadth ties	0.8788**		0.0477	18.4174	[0.7105, 0.9821]		
• External depth ties	0.6961**		0.1117	6.2345	[0.2710, 0.8714]		
Internal embeddedness						0.8761	0.7796
• Internal breadth ties	0.9024**		0.0226	39.991	[0.8265, 0.9470]		
• Internal depth ties	0.8630**		0.0324	26.6375	[0.7567, 0.9250]		
Subsidiary R&D-contributing role						0.9062	0.6182
• Basic research	0.7948**		0.0380	20.8891	[0.6774, 0.8744]		
• Applied research	0.8813**		0.0222	39.6466	[0.8158, 0.9308]		
• Research into new	0.7393**		0.0598	12.3679	[0.5521, 0.8672]		
• Development of new	0.7424**		0.0637	11.6489	[0.5404, 0.8725]		
• Own-design manufacturing	0.8250**		0.0356	23.1466	[0.7099, 0.8987]		
• Major improvements to	0.7228**		0.0550	13.1406	[0.5481, 0.8384]		

Note: VIF=Variance Inflation Factor; AVE=Average Variance Extracted; $^{**}p < 0.01$; $^{*}p < 0.05$ (based on a Student t(4999) distribution, two-tailed test).

Table 4. Validation of the measurement second order model. Discriminant Validity

	1	2	3	4	5
1. Corporate-level factors	**0.6943**	0	0	0	0
2. Country-level factors	0.0084	**0.6284**	0	0	0
3. External embeddedness	0.0204	0.3502	**n.a.**	0	0
4. Internal embeddedness	0.1260	0.1292	0.1493	**0.7796**	0
5. Subsidiary R&D-contributing role	0.0854	0.2776	0.2945	0.4048	**0.6182**

Note: Diagonal represents the average variance extracted; while below the diagonal the shared variance (squared correlations) are represented.

Table 5. Analysis of common method bias

CONSTRUCT / INDICATOR	Substantive factor loading	Variance explained by the substantive construct	Method factor loading	Variance explained by the method construct
Country-level factors				
• Level of competition	0.7033**	0.4946	0.0726	0.0041
• Demand market conditions	0.5787**	0.3349	-0.0245	0.0009
• Factor conditions	0.6668**	0.4446	-0.0010	0.0000
• Supplier and related industries	0.8506**	0.7235	-0.0565	0.0046
Corporate-level factors				
• Subsidiary entrepreneurship	0.7870**	0.6194	0.0633	0.0040
• Subsidiary initiative	0.8603**	0.7401	-0.0712	0.0052
• Subsidiary leadership	0.8642**	0.7468	0.0064	0.0000
External embeddedness				
• External breadth ties	0.7738**	0.5988	0.0904	0.0063
• External depth ties	0.8277**	0.6851	-0.1078	0.0108
Internal embeddedness				
• Internal breadth ties	0.8240**	0.6790	0.0875	0.0074
• Internal depth ties	0.9461**	0.8951	-0.0918	0.0085
Subsidiary R&D-contributing role				
• Basic research	0.4877 *	0.2379	0.3195	0.0968
• Applied research	0.8909**	0.7937	-0.0159	0.0002
• Research into new materials/specifications	0.5796 *	0.3359	0.1625	0.0245
• Development of new products/designs/prototypes	1.0552**	1.1134	-0.3234 *	0.0966
• Own-design manufacturing	0.9045**	0.8181	-0.0816	0.0068
• Major improvements to machinery/equipment/processes	0.8008**	0.6413	-0.0722	0.0040
AVERAGE		**0.6413**		**0.0165**

Note: ** p<0.01; * p<0.05 (based on a Student t(4999) distribution, two-tailed test).

Table 6. Structural model assessment

PATHS	Path coefficient	Standard error	t-value (bootstrap)	Confidence Interval (95%)	R^2	Effect size f^2	Stone-Geisser Q^2
Effects on external embeddedness					0.3581		0.1703
• Country-level factors → External embeddedness	0.5836**	0.0700	8.3394	[0.4445, 0.7160]		0.5250	
Effects on internal embeddedness					0.2665		0.1582
• Corporate-level factors → Internal embeddedness	0.3046**	0.0811	3.7563	[0.1415, 0.4602]		0.1238	
• External embeddedness → Internal embeddedness	0.2258 *	0.1096	2.0609	[0.0022, 0.4277]		0.0425	
Effects on subsidiary R&D-contributing role					0.5826		0.3196
• Corporate-level factors → Subsidiary R&D cont. role	0.1038	0.0869	1.1935	[-0.0614, 0.2765]		0.0189	
• Country-level factors → Subsidiary R&D cont. role	0.2084 *	0.0839	2.4845	[0.0510, 0.3805]		0.0827	
• External embeddedness → Subsidiary R&D cont. role	0.2340 *	0.0914	2.5590	[0.0517, 0.4100]		0.0810	
• Internal embeddedness → Subsidiary R&D cont. role	0.4148**	0.0758	5.4762	[0.2652, 0.5634]		0.2968	
Control variables on subsidiary R&D-contributing role							
• Subsidiary age → Subsidiary R&D cont. role	0.1410	0.0773	1.8252	[-0.0128, 0.2878]		0.0431	
• Subsidiary size → Subsidiary R&D cont. role	0.0362	0.0580	0.6245	[-0.0858, 0.1489]		0.0024	
• Home region → Subsidiary R&D cont. role	0.0361	0.0628	0.5742	[-0.1568, 0.0885]		0.0029	
• Entry mode → Subsidiary R&D cont. role	0.0043	0.0674	0.0637	[-0.1292, 0.1348]		0.0000	
• Industry effects → Subsidiary R&D cont. role	0.1256	0.0634	1.8830	[-0.0050, 0.2462]		0.0357	
Control variables on embeddedness							
• Corporate-level factors → External embeddedness	0.0891	0.0728	1.2247	[-0.0581, 0.2273]		0.0100	
• Country-level factors → Internal embeddedness	0.1979	0.1046	1.8908	[-0.0001, 0.4089]		0.0132	

Note: **$p < 0.01$; *$p < 0.05$ (based on a Student t(4999) distribution, two-tailed test).
Note: Following Henseler et al. (2009) we specify f^2=(R^2 included-R^2 excluded)/(1-R^2 included); According to Cohen (1988), f^2 values of 0.02, 0.15, and 0.35 signify small, medium, and large effects, respectively.

Table 7. Summary of the results from the post hoc assessment of mediating effects

MODEL 1: CORPORATE-LEVEL FACTORS AS INDEPENDENT VARIABLE								
Total effect of IV on DV			Direct effect of IV on DV			Indirect effect of IV on DV		
Coefficient	T-value	Bootstraping BC 95% CI	Coefficient	T-value	Bootstraping BC 95% CI	Mediators	Point estimate	Bootstraping BC 95% CI
0.2469**	3.1466	[0.0914, 0.4024]	0.0841	1.2042	[-0.0544, 0.2226]	Total indirect effect	0.1628	[0.0758, 0.2839]
						External embeddedness	0.0199	[-0.0052, 0.0626]
						External & Internal embeddedness	0.0090	[-0.0026, 0.0427]
						Internal embeddedness	0.1339	[0.0602, 0.2417]
						Contrast size effects		
						External vs. External&Internal	0.0109	[-0.0067, 0.0551]
						External vs. Internal	-0.1141	[-0.2200, -0.0325]
						External&Intenral vs. Internal	-0.1250	[-0.2314, -0.0476]
MODEL 2: COUNTRY-LEVEL FACTORS AS INDEPENDENT VARIABLE								
Total effect of IV on DV			Direct effect of IV on DV			Indirect effect of IV on DV		
Coefficient	T-value	Bootstraping BC 95% CI	Coefficient	T-value	Bootstraping BC 95% CI	Mediators	Point estimate	Bootstraping BC 95% CI
0.5069**	6.4611	[0.3514, 0.6624]	0.2346**	2.8516	[0.0715, 0.3977]	Total indirect effect	0.2723	[0.1574, 0.4130]
						External embeddedness	0.1304	[0.0226, 0.2630]
						External & Internal embeddedness	0.0589	[0.0115, 0.1356]
						Internal embeddedness	0.0831	[-0.0002, 0.1808]
						Contrast size effects		
						External vs. Internal.	0.0715	[-0.0639, 0.2156]
						External&Internal vs. Internal	0.0473	[-0.1030, 0.2180]
						External vs. External&Intenral	-0.0242	[-0.1426, 0.1135]

Note: BC=Bias Corrected; CI=Confidence Interval; 5,000 bootstrap samples; $^{**}p < 0.01$; $^{*}p < 0.05$ (based on a Student t(4999) distribution, two-tailed test).
'External' represents the path: Country-level factors → External embeddedness → Subsidiary R&D-contributing role.
'Internal' represents the path: Country-level factors → Internal embeddedness → Subsidiary R&D-contributing role.
'External&External' represents the path: Country-level factors → External embeddedness→ Internal embeddedness → Subsidiary R&D-contrib. role.

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