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Domestic alliance networks and regional strategies of MNEs: A structural embeddedness perspective

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ABSTRACT

We draw on a social network perspective to explain multinational enterprises' (MNEs) propensity to distribute their operations unevenly across various regions of the world. We focus on how the positioning of MNEs in their domestic network of strategic alliances affects their geographic scope; i.e. whether they concentrate on their home region or expand beyond it. We theorize that embeddedness in alliance networks constitutes a double-edged sword to the geographic scope of MNEs. Strong embeddedness in domestic alliance networks drives the development of location-bound firm-specific advantages (FSAs), which may narrow down MNEs' geographic scope. In contrast, moderate embeddedness leads to more non-location-bound FSAs, which reduce liability of foreignness, and hence motivate MNEs to widen their geographical scope. We thus predict a non-linear relationship between domestic alliance network embeddedness and MNE geographic scope. Furthermore, the impact of the domestic alliance network on MNE geographic scope hinges on the organizational ability to efficiently and effectively absorb resources stemming from the network. We test our hypotheses using FDI data from 302 U.S. MNEs in the information and communication technology industry for the period of 2001-2008, and generally find robust support for the hypothesized relationships.

Keywords: MNEs, network theory, regional strategy, embeddedness, absorptive capacity

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INTRODUCTION

What determines the geographic scope of a multinational enterprise (MNE)? Over the past decade there has been a surge of interest in the regional and global focus in international expansion strategies of MNEs (e.g., Arregle, Miller, Hitt, & Beamish, 2013, 2016; Banalieva & Dhanaraj, 2013) and in subsequent performance implications (e.g., Banalieva & Dhanaraj, 2013; Qian, Khoury, Peng, & Qian, 2010; Qian, Li, Li, & Qian, 2008). Rugman and Verbeke's (2004) perspective on the regional tendencies of large multinationals, which echoed Ghemawat's (2003) statement about a semiglobalized world, challenged the implicit assumption of globally competitive MNEs (Bartlett & Ghoshal, 1989). It opened up a debate calling for studies to develop a clearer picture of the dynamics in MNEs' propensity to expand within vs. beyond proximate and familiar environments, such as home regions. Because the coordination costs of internalization can outweigh its possible benefits, MNEs may concentrate activities within their home regions.

In the present study, we join the abovementioned debate and extend the current knowledge about regional and global strategies of MNEs by drawing on a social network perspective (Burt, 1992, 2005; Coleman, 1988). We emphasize the mechanisms and processes by which firms gain access to information and knowledge via the domestic structures of organizational pipelines (Lorenzen & Mudambi, 2013). We specifically point to the role of strategic alliance networks – i.e. networks of "voluntary arrangements between firms involving exchange, sharing, or co-development of products, technologies, or services" (Gulati, 1998: 293) – within which these firms are embedded in their home country. Our core argument is that embeddedness within home country alliance networks constitutes a double-edged sword to the geographic scope of MNEs. On one hand, embeddedness promotes the development of non-location-bound firm-specific advantages (FSAs) (Ahuja, 2000; Powell, Koput, & Smith-Doerr, 1996) and minimizes the liability of foreignness (LOF) thus broadening the scope of MNEs' foreign operations (Johanson & Vahlne, 2009). On the other hand, greater embeddedness within home country networks favors the development of strong location-bound FSAs (Narula, 2002), which could increase MNEs' propensity to configure their value chain activities within more proximate and familiar environments. While increased insidership in domestic networks facilitates local knowledge spillovers, especially if such networks are rich in knowledge-based assets and are important sources of firm value (Mudambi, 2008), access to international knowledge sources can be less needed (Cantwell & Mudambi, 2011). The impact of domestic alliance networks on MNE geographic scope hinges on the extent to which an MNE absorbs external knowledge efficiently and effectively (Tsai, 2001). The more the organization is embedded in an alliance network, the more it depends on its absorptive capacity to benefit from information and knowledge flows stemming from such a network. However, organizations with low embeddedness, as well as network outsiders, also need absorptive capacity to compensate for their relative lack of access to external knowledge and resources. In both cases, absorptive capacity should increase the scope of MNEs' foreign operations.

By explaining the MNE's propensity to disproportionately distribute its attention across world regions from a social network perspective, we aim at covering some existing gaps in the fields of international business and strategic management. So far, little attention has been paid to the role of structural network characteristics in the internationalization process of a firm as opposed to much research documenting the influence of interorganizational networks on firm strategy and performance (Burt, 2005; Powell et al., 1996). The existing research explaining firms' international expansion from the standpoint of structural embeddedness is limited to effects of firms' positions in home country social structures on the likelihood to form an international joint venture (Al-Laham & Souitaris, 2008; Shi, Sun, Pinkham, & Peng, 2014) or to initiate foreign expansion (Guler & Guillén, 2010; Yu, Gilbert, & Oviatt, 2011). In addition, research on networks and international diversification has primarily focused on new ventures (Aharonson, Tzabbar, & Amburgey, 2016; Freeman, Edwards, & Schroder, 2006; Manolova, Manev, & Gyoshev, 2010; Yu et al., 2011) and small and medium-sized enterprises (Lin & Chaney, 2007; Zhou, Wu, & Luo, 2007). Laursen, Masciarelli, and Prencipe (2012) attempt to unfold the nature of the relationship between firms' involvement in foreign markets and the social capital that their managers and employees may bring from having external interpersonal ties. Their study is, however, limited to investigating the role of localized social ties among individuals and is cross-sectional in its nature. Hence, the impact of home country interorganizational network structures on foreign expansion at the subsequent stages and the directions of such expansion remain unexplored. In addition, while the existing studies linking the initiation of the internationalization process to alliance network structures are primarily limited to the impact of network variables on a firm level (Guler & Guillén, 2010; Shi et al., 2014; Yu et al., 2011), the unique structural properties, such as network clustering, are set aside. Finally, while the benefits and opportunities for internationalization spanning from alliance network embeddedness are frequently highlighted, no attention is paid to the possibility that firms can have different abilities to leverage external knowledge for the purpose of internationalization.

Based on past research, we define the propensity to expand within the home region as opposed to outside the home region as home-region orientation (e.g., Banalieva & Dhanaraj, 2013; Rugman & Verbeke, 2008). Studying the tendency to prioritize one international expansion path over another allows us to theorize systematically on the strategic choices faced by the MNE and its motivations for such location choices (Banalieva & Dhanaraj, 2013). We examine differences in MNEs' positioning within home country alliance networks, and, thus in their access to resource and information flows stemming from such networks, at firm and group levels. With regard to the firm-level metrics, we single out variation in network range (Powell et al., 1996; Tortoriello, Reagans, & McEvily, 2012) and brokerage opportunities (Burt, 1992, 2005), while on the group-level we pick out the differences derived from density of ties within bounded groups (clusters) of firms (Coleman, 1988).

Overall, this study aims at contributing to the broad managerial debate on the design of international expansion strategies by examining the conditions for when MNEs restrict their geographic focus to their home regions. We emphasize the home-country context, specifically home-country alliance networks, as a key determinant of MNEs' geographic scope.

THEORY AND HYPOTHESES

Social network perspectives on internationalization and the importance of home country networks

The integration of network perspectives with theories of firm internationalization is a relatively recent phenomenon (Prashantham, 2005). The recent tendency to combine the two reflects developments in the knowledge-based view of the firm, which defines firms as "repositories of specialized knowledge and of the specialized inputs required to put this knowledge to work" (Demsetz, 1991: 172). The acquisition and internalization of external knowledge, specifically that of the technologically intense type (Oviatt & McDougall, 1994), within interorganizational network structures has been recognized as a key driver for successful foreign expansion (Inkpen & Tsang, 2005). Membership in networks and the involvement into various enduring exchange relationships with other firms directly and indirectly increases the potential for knowledge creation and acquisition, and facilitates its subsequent transfer (Inkpen & Tsang, 2005). Therefore, a social capital theory offers a prominent theoretical lens on the internationalization process of a firm.

Much research in the field of international business has been conceptualizing the idea that a richer and broader access to information and knowledge through various networks of relationships is important to the internationalization process of a firm (Johanson & Vahlne, 2009; Oviatt & McDougall, 1994; Welch & Welch, 1996; Zahra, Ireland, & Hitt, 2000). The underlying logic of this conceptualization is that once the firm's network of relationships is rich in information, knowledge, and other resources, this is likely to exert a positive impact on its level of technological advantage (Yli-Renko, Autio, & Tontti, 2002). By positively contributing to a firm's international growth (Autio, Sapienza, & Almeida, 2000; Yli-Renko et al., 2002), network relationships may subsequently shape its international expansion strategy. However, the strength of the influence of social capital on the degree of international diversification of the firm can vary depending on whether this social capital has been acquired within domestic or foreign networks (Guillén, 2002).

The accumulation of social capital by a firm is easier done when the scope of interfirm collaboration activities is bound to a specific location: "Organizational ties are generally likely to be good conduits for transmission of information and knowledge; when they are collocated within a bounded geographic space, this general effect holds even more strongly" (Bell & Zaheer, 2007: 960). The literature on international management acknowledges the role of the domestic environment and domestic interfirm networks for the development of firm-specific advantages (Johanson & Vahlne, 2009; Welch & Welch, 1996). As pointed by Chen, Chen, and Ku (2004): "New relationships to be sought in the foreign network are those that reinforce the flexibility of the domestic network". Domestic interfirm networks are characterized by relatively lower degree of uncertainty, higher confidence of cooperation, and potential for superior knowledge flows (Bell & Zaheer, 2007). Hence, firms are more likely to rely on their home country ties in the process of developing capabilities. Structural embeddedness within home country networks of relationships can provide firms with the means and mechanisms by which they could establish credibility and legitimacy and, thus, develop new or advance existing capabilities for internationalization. Such organizational preferences are inherent in firms from locations with both stable (Guillén, 2002) and dynamic institutional environments (Kiss & Danis, 2010).

Extant research on business groups suggests that home country network structures are important for firm competitiveness. Structural network embeddedness is a robust approach to depict the direct and indirect ties of an individual firm, as well as to consider the implications of the overall network structure in which a firm is situated. The meta-analytical study by Carney, Gedajlovic, Heugens, Van Essen, and Van Oosterhout (2011) acknowledges that business group affiliation has a statistically significant effect on firm performance. Moreover, the authors conclude that the effect of business groups for firm performance is more complex than the effects of a simple categorical attribute, as "business groups are highly variegated, complex phenomena, implying that nuanced methodologies and theories are necessary to bring their core attributes to light" (Carney et al., 2011: 451). In the context of a multinational firm, business groups can be considered a source of location-bound ownership advantages, which arise from access to intragroup transactions. These advantages are difficult to transfer abroad and, additionally, their over-accumulation domestically can limit MNEs' propensity to venture abroad (Narula & Santangelo, 2012).

Home country networks, FSA development, and the dynamics of globalization

MNEs' locational choices are generally a function of the limits to resources, the bounded rationality of firms, and the dynamism and predictability of business environment. The essence of strategic tradeoffs faced by MNEs and their motivations for certain location choices are reflected in the dynamic interplay between ownership and location advantages (Benito & Gripsrud, 1992; Cantwell, 1995; Dunning, 1998). Transaction cost economics (TCE) and the resource-based view (RBV), which constitute two main pillars of mainstream international business theory (Rugman & Verbeke, 2003), point to the notions of ownership (FSAs) and country-specific advantages (CSAs). The theory predicts that MNEs enter foreign markets to exploit their FSAs under the constraint of LOF. In addition, MNEs need to learn how to counterbalance the risk of foreign activity when exploiting host CSAs against the benefits of transferring FSAs (Rugman & Verbeke, 2003). Both TCE and RBV are also consistent with the idea that distance impedes the extent of international business activity by increasing transaction costs and decreasing the value of the investments that link non-location-bound (NLB) FSAs with location-bound (LB) FSAs (Rugman & Verbeke, 2005). Moreover, the decay of FSAs over time and the emergence of better strategic opportunities can trigger relocation or divestment decisions (Narula & Santangelo, 2012).

The relative competitive advantage and global success of MNEs are mainly derived from domestic LB-FSAs, NLB-FSAs, and the interaction between them that provides the ability to overcome LOF (Asmussen, Pedersen, Devinney, & Tihanyi, 2011). In other words, a necessary and sufficient condition for MNEs to do business abroad is that their relative advantages are strong enough to outweigh the costs of doing so. International management research has put much focus on explaining the international competitiveness and geographic scope of MNEs through the factors that are identified with NLB-FSAs. However, the complementary importance of LB-FSAs to MNEs' propensity to venture abroad has received scarce attention empirically.

In general, most LB-FSAs are exploited within domestic locations, where MNEs benefit from co-location and insidership, knowledge of institutions, and privileged access to intragroup transactions and intermediate goods. However, contrary to NLB-FSAs which are always associated with a greater capacity to penetrate geographically distant markets and achieve global geographic scope, the effect of

LB-FSAs on the geographic scope is twofold (Narula, 2002; Narula & Santangelo, 2012). On the one hand, LB-FSAs can serve as a means of developing NLB-FSAs and, hence, help overcoming LOF. Initial NLB-FSAs often derive from home country location boundedness. On the other hand, LB-FSAs may instigate MNEs to configure their value chain activities and resources in favor of a certain location. While domestic location boundedness typically constitutes the basis for generating economic rents, its advantages are often difficult and costly to transfer across the border. Moreover, concentrating value-adding activities domestically, rather than dispersing them across the globe, often makes sense economically as that minimizes coordination and control costs and allows managerial resources to be more efficiently and effectively utilized. When advantages are hard to transfer or locating assets abroad does not yield greater efficiency, firms may develop a strong bias toward locations with the lowest LOF (Johanson & Vahlne, 2009). Empirical evidence shows that MNEs tend to concentrate their sales and assets in their home-regions, thus pursuing regional rather than global strategies (Asmussen, 2009; Rugman & Verbeke, 2004).

Embeddedness within domestic alliance networks provide an explanation for the pattern of interrelations between NLB- and LB-FSAs and their subsequent influence on the scope of MNEs' international operations. In itself, such embeddedness constitutes a source of both NLB-FSAs and LB-FSAs developed and exploited in the home country. Low embeddedness within domestic alliance networks implies poor access to external resources that provide strategic opportunities and affect firm behavior and outcomes (Lavie, 2006). Outsidership in domestic networks will affect a firm's ability to develop sufficient NLB-FSAs to expand globally (Johanson & Vahlne, 2009). As a result, internationalization may be narrow in its scope or be unsuccessful. This could affect any firm, but whereas smaller firms often suffer from resource deficiencies and do not possess the knowledge and capabilities required for successful internationalization (Lin & Chaney, 2007; Manolova et al., 2010; Zhou et al., 2007), such constraints are less likely to affect larger firms. However, under conditions of technological dynamism and uncertainty, alliance networks form an important mechanism for firms of any size to obtain knowledge and other complementary assets and recognize the direction of technological change (Rosenkopf & Schilling, 2007).

An increase in the embeddedness within domestic alliance networks implies a higher likelihood of getting access to unique information and knowledge pools and, consequently, to enhanced learning opportunities (Powell et al., 1996). Information and knowledge as well as other assets appropriated via networks of ties can be reconfigured and combined in ways that increase the competitive advantages of firms (Patel & Terjesen, 2011). As such, embeddedness within domestic network structures promotes NLB-FSAs, which provide MNEs with a means to decrease the LOF from expanding beyond the boundaries of proximate and familiar environments. Research has shown that interorganizational networks facilitate knowledge transfer (Inkpen & Tsang, 2005), enhance firms' innovation output (Ahuja, 2000), provides access to capabilities of and information about direct and indirect partners (Baum, Calabrese, & Silverman, 2000), and strengthens the ability to identify value-creation opportunities (Burt, 2005).

Still, insidership could become a double-edged sword when excessive domestic alliance network embeddedness drives firms to set a narrow geographic scope. For example, Narula (2002) finds that firms which are highly integrated with the system of innovation in their home country may become biased towards domestic activities. Firms may get increasingly embedded in bounded networks of collaboration when competitive advantage is temporary, hard to maintain, or depends on complex adaptation (Uzzi, 1996; see also Cantwell & Mudambi, 2011). If knowledge development is relatively narrow or "confined", Cantwell and Mudambi (2011: 212) argue that: "[T]he more likely a firm will rely on local knowledge inflows and the less likely it will need access to international knowledge sources outside the country in which it is located." Because insidership in domestic networks provide value creating opportunities, spanning the boundaries of such networks becomes important and perhaps even crucial for the success of firms; yet, boundary spanning is challenging and can also lead to organizational paralysis (Schotter, Mudambi, Doz, & Gaur, 2017).

Excessive embeddedness within domestic alliance networks requires complex coordination and considerable resources to assure greatest benefits, and that may challenge organizational information processing capacity (Simsek, 2009). Domestic network advantage may also become too location-specific and difficult to leverage beyond proximate and familiar environments (Burt, 2007; Guler & Guillén, 2010). At the same time, broad geographic scope inflates organizational costs of coordinating foreign operations (Kostova & Zaheer, 1999). Because there are cognitive boundaries to coordination and integration capacity, it becomes more expensive, both in terms of managerial and financial resources, for MNEs to maintain the network of geographically dispersed subsidiaries (Narula, 2014). Hence, when MNEs' competitiveness depends on strong LB-FSAs, such as networks of strategic alliances, MNE may prefer to deploy an international expansion strategy that minimizes LOF. Under strong location boundedness, home-region orientation will maximize benefits and minimize costs (Asmussen, 2009, 2012; Rugman & Verbeke, 2005).

Several real-world examples can be made with regard to this line of reasoning. Wal-Mart is the world's biggest retailer, and is also a dominant player in the domestic network of interorganizational relationships (Christopherson, 2007). While being highly embedded domestically, Wal-Mart became a technologically advanced company and industry's best-practice. Nevertheless, Wal-Mart has failed multiple entries into distant and unfamiliar environments, such as Germany, South Korea, Japan, and Indonesia. Inability to achieve sustainable competitive advantage in host regions emanated from Wal-Mart's reduced ability to adapt to unfamiliar environments and its focus on exploiting the bargaining power it had domestically (Christopherson, 2007). Another example is Corning – an electronic components company. In 2000s, Corning implemented a series of restructurings of its global operations designed to improve operating efficiencies, consolidate research efforts, and to better meet customers' expectations (Corning's 2004 and 2005 Annual Reports). The company faced a number of risks including difficulty of effectively managing its diverse global operations (Corning's 2005 Annual Report). Particularly, Corning closed and consolidated a number of its subsidiaries in Europe and Asia. The divestments were preceded by a number of domestic strategic alliances formed directly by Corning or indirectly via its joint ventures to improve the company's competitive position. For example, in 2001 Corning formed strategic alliances with Quantum Bridge Communications to support the deployment of fiber and optical components and Genencor International to fund R&D in the fields of biotechnology and silicon chemistry in 2001 (Lightwave Online). Managing a network of strategic alliances is an integral part of Corning's business strategy.

Describing networks

We selected our network constructs on the basis of several criteria. First, the constructs should emphasize the multilevel nature of network advantage (Brass, Galaskiewicz, Greve, & Tsai, 2004; Yang, Lin, & Lin, 2010). Firms develop competitive advantage from their individual positioning in the network and from being a member of interconnected network cluster. Second, the constructs should capture the advantage a firm can derive from being a member of a network, i.e. the constructs should be attributable to the structural dimension of embeddedness. We focus on structural rather than relational dimensions of embeddedness since they are, to a certain extent, substitutes for one another (Rowley, Behrens, & Krackhardt, 2000), and networks structures provide sufficient governance mechanisms and behavioral norms to guide actions (Rowley et al., 2000). Networks structures also enable organizations to develop new knowledge, capabilities, and opportunities, as well as exploiting existing knowledge, capabilities, and operations. Relational network constructs emphasize advantages through learning in individual relationships (Gulati, 1998), but since we focus on how the availability of information and opportunities for FSA development and exploitation, relying on structural network constructs is better aligned with our theoretical reasoning. Third, the constructs should influence the geographic scope of the firm through FSA development, yet they should be conceptually different from each other. Finally, the theoretical network constructs should have sufficient theoretical and empirical support in the literature. Three constructs met the above criteria: centrality and brokerage at the firm level and density of interconnectedness at the network cluster level. Existing research on interorganizational network structures consistently emphasizes the role of these three variables for organizational behavior and outcomes (Provan, Fish, & Sydow, 2007).[1]

Network range is a form of network centrality (Tortoriello et al., 2012). Centrality provides multiple benefits for firms, such as network status (Podolny, 1993) and access to information and resources (Powell et al., 1996). While network status stems from ties to the most central firms in the whole network, not all information, knowledge and assets used for FSA development are sourced via such ties. In this paper, we are interested in firms' access to information, knowledge, and other resource flows via various direct and indirect ties within their range, i.e. firms' network range.[2]

Brokerage advantage is associated with benefits from regulating information flows (Burt, 1992). Brokers minimize redundancy and enjoy more efficient and rich information flows within their local network of ties (Burt, 2007). Firms possess a brokerage advantage when their partners are not connected between themselves (Burt, 1992).[3]

Firms are embedded within broader structural groups in a whole network, i.e. network clusters (Sytch & Tatarynowicz, 2014). Density is an important feature of network clusters. It proxies the information richness and the speed of its exchange. While dense clusters facilitate information exchange through multiple overlapping ties, excessive density may also inhibit the existence and the utilization of diverse and novel information (Gilsing, Nooteboom, Vanhaverbeke, Duysters, & Van Den Oord, 2008).

The direct effect of network range on home-region orientation of the MNE

The notion of network range points to the ability to span multiple knowledge pools (Tortoriello et al., 2012). Organizations with greater network range have higher likelihood to get access to information, knowledge, and other resources and, consequently, expand their learning opportunities (Powell et al., 1996). Resources acquired from multiple direct and indirect network ties can then be reconfigured and combined into viable and synergistic forms that may further advance a firm’s commercialization efforts and improve its competitive advantage (Patel & Terjesen, 2011). Extensive access to information and knowledge stocks via disparate network nodes is, thus, key in gaining technological advantage: “Technology confers competitive advantage for a firm to access global markets and overcome the challenges of increasing distance from the home market, particularly in three areas: diversity of technology standards, demand for differentiation, and global complexity of management” (Banalieva & Dhanaraj, 2013: 94). In that way, greater network range helps generate sufficient non-location-bound FSAs to expand beyond a familiar home region of an MNE, thus, decreasing its home-region orientation.

In contrast, there may exist a point of diminishing returns to network range, where numerous direct and indirect network connections are no longer advantageous and can decelerate global strategy development, as they can lead to “over-accumulation” of domestic social capital. Interorganizational scholars have emphasized that after a certain threshold the degree of embeddedness can be counterproductive (Uzzi, 1997). Maintaining a wide-ranging network may lead to information overload and undermine organizational ambidexterity: "If information overload occurs due to the organization's numerous connections, the central organization may further routinize its filters to focus on certain information and regard other information as unimportant" (Simsek, 2009: 608). MNEs with higher domestic network range can concentrate their activities to their home country networks and use more of their resources to maintain and manage such networks. When MNEs spend their time and effort in the consolidation of domestic network positions, less is left to consider and develop global expansion strategies. With a given resource configuration, crossing defined economic boundaries of a home region and spreading operations globally requires resources, bears risks, implies higher costs of organizing, and yields lower marginal rents (Asmussen, 2009, 2012; Rugman & Verbeke, 2005). At the same time, expansion within a home-region does not constitute a substantial source of uncertainty and may be a more rational choice for MNEs. As a result, greater domestic network range may push MNEs to concentrate operations within their home region rather than outside of it. Hence, we hypothesize a curvilinear U-shaped relationship between MNE network range and home-region orientation.

> *Hypothesis 1. Network range has a curvilinear (U-shaped) relationship with MNEs' degree of home-region orientation.*

The direct effect of brokerage on home-region orientation of the MNE

Brokerage advantage is associated with benefits from regulating information flows (Burt, 1992). Brokering firms act as intermediaries between other firms otherwise disconnected from each other, thus, spanning "structural holes" in their networks. Having a brokerage advantage can eventually result in gaining "access to a wider diversity of information, early access to that information, and control over information diffusion" (Burt, 2005: 16). These three advantages provide a firm with "an opportunity for information arbitrage: the strategic deployment of information to create value" (Burt, 2005: 17). Organizations that span many structural holes can improve their learning capabilities and gain more useful and diverse knowledge. This may increase their organizational technological advantage and make FSAs more interchangeable across world regions and facilitate global strategy development (Banalieva & Dhanaraj, 2013). Moreover, as higher brokerage implies elimination of redundant ties, firms with higher brokerage would be able to employ scarce management attention in more efficient ways including its utilization for extending the scope of international expansion strategies (Bouquet & Birkinshaw, 2011). Conversely, organizations unable to span structural holes are less exposed to knowledge creation and its exploitation and, hence, are less likely to develop non-location-bound FSAs that can be subsequently used to overcome the liability of interregional foreignness.

However, similarly to network range, a brokerage advantage is liable to having its switching point. Spanning too many structural holes can impede the global strategy development process of MNEs and lead to regional market presence instead. Sizeable brokerage advantage is by nature local and context-specific (Burt, 2007; Guler & Guillén, 2010), and not readily applicable beyond firms' immediate network or familiar environments. Possession of substantial brokerage advantage provides MNEs with opportunities to create value by bridging institutional distance and institutional contradictions (Tracey & Phillips, 2011), or by identifying new structural holes (Burt, 2005) within their home country or more proximate and familiar environments, such as home regions. However, as brokerage advantage loses its strategic value outside the boundaries of such environments, MNEs risk failure when penetrating more distant locations. The ways to manage networks of relationships and manipulate information flows in more proximate and familiar environments may be seen as inappropriate elsewhere (Christopherson, 2007; Xiao & Tsui, 2007). In addition, firms with high brokerage can be prone to maximize short-run benefits (Burt, 2005). Regional expansion may maximize such benefits by being considered as the first best solution to internationalization processes (Rugman & Verbeke, 2005). Hence, under high levels of brokerage, a narrow geographic scope could be preferred to global orientation, as it does not constrain the fungibility of MNEs' FSAs (Asmussen, 2012).

Taken together, the abovementioned arguments suggest a U-shaped relationship between brokerage and home-region orientation, such that having moderate brokerage advantage is important to the internationalization process as it provides control over information diffusion, but spanning too many structural holes in the domestic environment will more likely result in developing competencies that are much local and context-specific and yield superior returns when leveraged in the home region. We therefore predict the following:

> *Hypothesis 2. Brokerage has a curvilinear (U-shaped) relationship with MNEs' degree of home-region orientation.*

The direct effect of network cluster density on home-region orientation of the MNE

Contrary to network range and brokerage, density is a key cluster-level property that is referred to as the extent of interconnections among firms of a specific network cluster: higher levels of interconnectedness imply greater density (Gnyawali & Madhavan, 2001). Dense clusters can have a substantial impact on firm's behavior and performance. Since dense clusters operate in the form of "closed" systems, their members have higher propensity to develop trust, common norms and behavioral patterns (Coleman, 1988). Dense clusters also enable a rapid diffusion of information and knowledge among their members thus enhancing the efficiency and speed of cooperation (Gilsing et al., 2008). There are also downsides to being located in a dense group of relationships. Densely connected organizations are less likely to get access to diverse information (Granovetter, 1973). In addition, no particular firm in a dense cluster can obtain sole access to unique assets or other resources; as a result, dense clusters bring less competitive variety among their members (Gnyawali & Madhavan, 2001).

We argue that, similar to network range and brokerage, the effect of cluster density on the MNE's propensity to expand activities beyond the home region is curvillinear. On one hand, network clusters supply their members with a bundle of common resources. Density increases the overall volume and speed of resource flows between members of the cluster. Due to shared collection and distribution routines, dense clusters are associated with superior transfer of complex knowledge and decreased competitive impediments (Tortoriello et al., 2012). In addition, both direct and indirect connections improve firms' inner abilities to screen information and resources and to interpret them on potential relevance and value (Gilsing et al., 2008). Hence, an increase in cluster density may bring greater levels of technological advantage, which is also a non-location-bound FSA that propagates MNEs globally (Banalieva & Dhanaraj, 2013). As a result, the propensity of MNEs to focus on their home region should decrease.

On the other hand, substantial interconnectedness within the MNE's cluster may divert the propensity to expand within the home region in the opposite direction. Even though density facilitates the accumulation of shared knowledge, being located in a dense cluster is likely to impede a firm's volition for searching and being innovative (Gilsing et al., 2008), also in terms of applying more broad geographic focus. A firm that is located in a dense cluster, and which aims at creating unique resource advantages, may hence be less inclined to doing so, because of existing common norms and homogeneous behavioral patterns (Kraatz, 1998). Finally, because of multiple overlapping ties within its cluster, a firm would not be able to structure its own network of relations more efficiently by disconnecting redundant ties, and effectively, by connecting to areas of the network that have previously not been reached (Gnyawali & Madhavan, 2001). This would push such firm to concentrate its attention on maintaining redundant local connections, thus, limiting its financial and managerial resources to develop global orientation in its international expansion strategy. Because the costs of doing business outside an MNE's home region are significantly higher than inside of it (Asmussen, 2009), the MNE's propensity to expand regionally rather than globally may increase. Therefore, based on the abovementioned arguments, we hypothesize the following relationship between cluster density and home-region orientation:

Hypothesis 3. Cluster density has a curvilinear (U-shaped) relationship with MNEs' degree of home-region orientation.

The moderating role of absorptive capacity

Absorptive capacity is defined by Cohen and Levinthal (1990: 128) as a firm's inner ability to "recognize the value of new, external information, assimilate it, and apply it to commercial ends." The ability of an organization to develop FSAs and gain competitive advantage from network resources is contingent on its degree of absorptive capacity (Lorenzoni & Lipparini, 1999; Tsai, 2001; Zahra & George, 2002). Although embeddedness within alliance networks provides important access to new knowledge, its impact on FSA development depends on the extent to which the organization can efficiently and effectively absorb such new knowledge. The better the organization's access to other organizations' knowledge, the more it needs absorptive capacity to benefit from such knowledge. Research has documented that a network position is likely to exert a more positive impact on the innovation output and financial performance if the organization has an improved ability to effectively transfer knowledge from other organizations (Tsai, 2001). At the same time, organizations with insufficient embeddedness within alliance network structures, as well as network outsiders, but with high absorptive capacity, may compensate for the absence of access to external knowledge and resources. Such organizations are likely to develop FSAs (primarily, non-location-bound) by better identifying new technological trends, developing new products and solutions and successfully commercializing them (Tsai, 2001). Hence, absorptive capacity is likely to attenuate the relationship between a network position and the geographic scope of the firm by positively affecting FSA development. However, despite the general interrelation between absorptive capacity and a network position, there may be specific moderation mechanisms depending on how a network position is conceptualized.

Moderation of the relationship between network range and home-region orientation

Strong absorptive capacity facilitates learning and allows a firm to more efficiently identify and utilize external knowledge from both the direct and the indirect ties that lie within the firm's range. The advanced learning effects amplify the economies of scale and synergies spanning from the firm's connectedness (Sampson, 2007), which can further increase its cost efficiency, decrease the cost of failures, and shorten the new product development cycle (Xiong & Bharadwaj, 2011). The resulting competitive advantage is likely to be enhanced and subsequently internalized and transferred within MNE's boundaries into more distant locations (Buckley & Casson, 1976). Because knowledge embedded in interorganizational networks generates strategic value for a firm (Spender, 1996), this may cause positive spillovers in its competitive advantage and, thus, its propensity to penetrate global markets.

With higher degrees of absorptive capacity, the point of diminishing returns to network range is attenuated because absorptive capacity enhances the efficiency of organizational information filters. This, in turn, increases the propensity to effectively absorb and utilize external information and knowledge and minimizes the structure-flexibility dilemma (Weick, 1969). In such respect, maintaining a wide-ranging network and handling divergent knowledge flows, expertise, and potentially incompatible ways of seeing the world becomes less problematic. The released managerial attention can be directed towards the development of global strategies.

Higher degrees of absorptive capacity combined with the access to external knowledge are likely to erode a home-region focus and, hence, promote the development of global strategy. Moreover, strong absorptive capacity may compensate for a firm's insufficient network connectedness by enhancing information filters, which should facilitate adapting more successfully to the external environment. We therefore hypothesize:

Hypothesis 4. Having stronger absorptive capacity attenuates the curvilinear (U-shaped) relationship between network range and MNEs' degree of home-region orientation.

Moderation of the relationship between brokerage and home-region orientation

As noted earlier, MNEs possessing both inferior and superior levels of brokerage advantage are more likely to strengthen home-region orientation. As with network range, we argue that MNEs' absorptive capacity attenuates the hypothesized curvilinear relationship.

When an MNE is more constrained (i.e. has weaker brokerage advantage) in its network, it has a limited ability to enjoy more effective and efficient flows of information, knowledge, assets, and status from its network, and translate them into a positive resource asymmetry to secure competitive advantage (Burt, 1992). However, as MNEs with stronger absorptive capacity have greater efficiency in absorbing information and knowledge relative to what they could have absorbed and given the resources they have deployed (Narasimhan, Rajiv, & Dutta, 2006), these MNEs' inability to organize resources in a cost-effective manner (Gnyawali & Madhavan, 2001) will be compensated. The control over information and resource flows will be less crucial for generating sufficient non-location-bound FSAs to expand outside the home region.

When the MNE spans too many structural holes in the home country network, strong absorptive capacity can decrease the risk of failure when shifting from regional to global orientation in international expansion strategies. The benefits coming from the combination of the ability to regulate network resources and strong absorptive capacity may be more generic and the FSAs of MNEs are more likely to obtain a non-location-bound character. MNEs may develop better understanding of how to apply their domestic experience to manage interfirm networks and bridge structural holes in distant and unfamiliar environments.

Based on the abovementioned reasoning, we hypothesize the following moderating relationship of absorptive capacity:

Hypothesis 5. Having stronger absorptive capacity attenuates the curvilinear (U-shaped) relationship between brokerage advantage and MNEs' degree of home-region orientation.

Moderation of the relationship between cluster density and home-region orientation

The complementary function of firm's own absorptive capacity to generate sufficient non-location-bound FSAs may be triggered when interconnectedness within a network cluster is either insufficient or excessive. If insufficient, strong absorptive capacity can compensate for the relative absence of an environment that boosts knowledge recombinant processes and develops FSAs. If excessive, the efficient organizational information filters should break the tendency of cohesive clusters to produce redundancy, thereby allowing for discovering new knowledge recombinations that emanate from cohesive relationships. A firm with a developed inner ability to filter out redundant information (i.e. with strong absorptive capacity) is less likely to fall into the problem of searching through non-redundant ties that comes at a price and bears certain risks. Moreover, as highly dense networks are characterized by rapid flows of information and resources, and lower costs of their access, firms with high absorptive capacity would make the best use of these benefits. Instead of tolerating redundant information and resource flows within a cohesive network cluster, a firm with strong absorptive capacity can develop common language and shared experiences with such redundant contacts (Xiong & Bharadwaj, 2011). Finally, absorptive capacity may compensate for relative homogeneity of external knowledge and resources. Firms with high absorptive capacity are likely to develop non-location-bound FSAs by better identifying new technological trends and developing new products (Tsai, 2001), diffuse them across cluster members and increase the cluster's overall competitive advantage.

Based on that reasoning, we hypothesize that the combination of cluster density and firm's absorptive capacity facilitates the process of novelty creation and exchange, thus improving MNEs' non-location-bound FSAs that attenuate their home-region orientation and propagate global focus.

Hypothesis 6. Having stronger absorptive capacity attenuates the curvilinear (U-shaped) relationship between cluster density and MNEs' degree of home-region orientation.

METHODOLOGY

Research setting and data

The research setting for this study is the information and communications technology (ICT) industry in the U.S., which covers MNEs with the following primary three-digit SIC codes: 357 (computer and office equipment), 366 (communications equipment), 367 (electronic components and accessories), and 737 (computer programming, data processing, and other computer related services). These SIC codes were also used to draw the boundaries of the network, i.e. the main partnership activity had to fall within the ICT industry according to four abovementioned SIC codes. We select the ICT industry for a number of reasons. First, liberal foreign direct investment (FDI) policies in the ICT industry have led to substantial FDI across the world and, especially across the emergent economy regions (Sun & Lee, 2013). Such industry-specific FDI liberalization significantly reduces noise due to countries' policy-specific FDI barriers. Second, prior research shows that the ICT industry is characterized by intensive alliance formation, which enhances the variance, reliability, and meaningfulness of alliance network variables (Lavie & Rosenkopf, 2006; Rosenkopf & Schilling, 2007). Finally, the ICT industry is characterized by significant technological dynamism (Rosenkopf & Schilling, 2007). Technological dynamism increases the proportion of firms in the industry that engage in alliances (Rosenkopf & Schilling, 2007), which increases the likelihood that FSAs originate from alliance network embeddedness.

To test the hypotheses, we collected FDI data for the period of 2001 to 2008 on the population of MNEs with primary SIC code in the ICT industry, headquartered in the U.S. and which had been publicly traded on the U.S. stock exchanges. The worldwide ICT industry is heavily dominated by the U.S.-based firms (Lavie & Rosenkopf, 2006). The domination of U.S. companies is largely due to their rapid productivity expansion in the ICT industry in 1990s, which created an overall gap in ICT productivity between the U.S. and the rest of the world (Van Ark, Inklaar, & McGuckin, 2003). The period of 2001-2008 is considered stable in terms of global FDI inflows and outflows and firm alliance activity. That allows us to reduce the undesirable noise that could otherwise be particular to our data if shifting the year interval backward (the information technology bubble) or forward (the global financial crisis).

We define an MNE as a company that has at least one FDI, i.e. has a subsidiary outside the U.S. Following established practice, FDI is defined as ownership of at least 10% of the equity in the foreign entity (e.g., Benito & Gripsrud, 1992). We did not include FDI into countries with harmful preferential tax regimes, according to the list developed by the Organization for Economic Cooperation and Development (OECD) as part of the project against “harmful tax practices” of its Committee on Fiscal Affairs (CFA). We collected the data on company’s FDI from company 10-K fillings available in the EDGAR database.

To construct the ICT network and derive network and alliance portfolio indicators, we used the alliance records from the SDC Platinum database, complementing missing data on interfirm collaborations from 10-K fillings available in the EDGAR database. Following previous studies (e.g., Lavie & Rosenkopf, 2006), we applied a conventional five-year window as the typical duration of alliances to construct alliance networks within the U.S. ICT industry as of the end of each analyzed year. Not all MNEs were visible in the bounded alliance network throughout all analyzed years. We therefore substituted missing network and alliance portfolio data with values used to indicate non-membership.

Overall, our sample consists of 302 MNEs, 194 out of which had been engaged in at least one strategic alliance within the ICT industry throughout the analyzed period. By targeting all listed firms we minimize self-selection bias related to the potential exclusion of firms without access to alliance network structures. Therefore, these 302 MNEs constitute the population of listed U.S. MNEs with primary SIC codes in the ICT industry, for which there existed publicly available firm-level data throughout the whole 2000-2008 period. Because we lag all the independent variables one year (to facilitate the direction of causality), additional data was collected for the year 2000. The MNEs also had to be active throughout the following time interval.

Measures

Dependent variable

Following prior research, we measure the MNE’s home-region orientation with the ratio of rest of its home-region FDI to total FDI, minus the ratio of its global FDI to total FDI (Asmussen, 2009; Rugman & Verbeke, 2008). The higher the value, the greater the MNE’s home-region orientation and the lower its global orientation. In line with research on international diversification (e.g., Qian et al., 2010; Wiersema & Bowen, 2008), we consider the Americas (excluding the U.S.) as the home region for the U.S. firms, while global operations include investments elsewhere, i.e. other than in home region. In the robustness checks section, we also discuss the sensitivity of our results to other region taxonomies. Asmussen (2009) suggests using the normalization based on GDP data, but current research argues that doing so has little practical appeal (Banalieva & Dhanaraj, 2013). While some studies measure home-region orientation with the ratio of rest of home-region sales to foreign sales (Banalieva & Dhanaraj, 2013), we do not do so because not all our cases have positive values of global FDI, which leads to the dividing-by-zero problem for companies without FDI in host regions. However, as noted by Banalieva and Dhanaraj (2013), both indicators are consistent measures of home-region orientation.

Independent variables

Network range. Following Tortoriello et al. (2012), we use information centrality (Stephenson & Zelen, 1989), which we have computed based on the nearness matrix in UCINET VI (Borgatti, Everett, & Freeman, 2002), as a proxy for network range. Information centrality is a closeness measure and is a function of the geodesic distance between any two firms. Contrary to other centrality measures, closeness centrality captures the intensity of firm collaboration within its surrounding community (Wasserman & Faust, 1994). But unlike other closeness centrality measures, which assign maximum weight to the shortest path between two nodes, information centrality uses all paths in firm's network and weights them based on their length. Firms which score high information centrality are more likely to have greater access to information, knowledge, and other resources via direct and indirect ties. We assign the information centrality score equal to zero for isolated firms with no ties.

Brokerage. We have also followed prior research in measuring brokerage with the reverse-signed index of Burt's (1992) constraint. The brokerage measure indicates the non-redundant portion of relationships in a firm's local network (Burt, 1992). We perform computations in UCINET VI (Borgatti et al., 2002). In line with other studies utilizing Burt's (1992) brokerage measure (e.g., Guler & Guillén, 2010), we have assigned a value of zero, the maximum, to isolated nodes meaning that no ties can constrain the firm. Conversely, when the brokerage measure approaches the value of -1, the firm becomes more constrained and loses brokerage advantage.

Cluster density. To compute cluster density, we first applied the Girvan-Newman algorithm (Girvan & Newman, 2002) to partition the overall network as of the end of each analyzed year into smaller subsets (clusters). This clustering technique takes into account the betweenness centrality scores of network ties and requires no prior knowledge about the segmentation of the overall network. The Girvan-Newman algorithm had found an application in multiple organizational studies (e.g., Gulati, Sytch, & Tatarynowicz, 2012). After clustering the network into network clusters, we computed cluster density, which is equal to the total of all within-cluster ties divided by the number of possible ties. Cluster density measures the extent of interconnection among the firms in their cluster. Because the network is valued, the density score can exceed the value of 1. We assign the density score equal to zero for firms, which have not been a member of any cluster in a given year.

Absorptive capacity. The seminal definition of Cohen and Levinthal (1990) has a rather broad nature that has led to an array of conceptualizations and operationalizations of absorptive capacity (Zahra & George, 2002). To narrow down the wide range of possible absorptive capacity interpretations, we follow Narasimhan et al. (2006) and conceptualize absorptive capacity as "the efficiency with which a firm absorbs, relative to what it could have absorbed given the resources it has deployed" (p. 512). This conceptualization allows viewing absorptive capacity not only as a traditional complementary capability (Milgrom & Roberts, 1995) that enhances the benefit of occupying beneficial network position, but also underlines the property of absorptive capacity to mitigate possible negative effects from such embeddedness on the geographic scope of the firm. This approach is consistent with the concern that insulated resources and capabilities may not be effective as single assets for conducting strategic activities and developing FSAs.

In line with Narasimhan et al. (2006), we estimated this efficiency with which a firm absorbs knowledge by measuring the difference between the actual and the maximal levels of know-how absorbable given the firm's resources. This is done in several steps.

First, we estimate the know-how frontier that predicts the know-how absorbable under the most efficient utilization of the firm's resources. The main purpose of the estimation is to separate the random shock, ε_{it}, from the inefficiency of absorbing know-how, η_{it}, and derive absorptive capacity measures using the estimation of the inefficiency term, η_{it}. To do this, we use the statistical technique called stochastic frontier estimation (SFE), which allows us to obtain the discrepancy term when maximizing the output a firm could produce given a set of inputs independently of the error component. In our case, we apply SFE to estimate the following equation (Narasimhan et al., 2006) in Stata 14:

$$\begin{aligned}(1)\qquad \ln(\text{know-how absorbed}_{it}) &= \alpha_0 + \alpha_1 \ln\left(\text{R\&D intensity}_{it}\right) + \alpha_2 \ln\left(\text{marketing intensity}_{it}\right) \\ &+ \alpha_3 \ln(\text{innovation stock}_{it}) + \alpha_4 \text{market conditions}_i + \varepsilon_{it} - \eta_{it},\end{aligned}$$

where;

know-how absorbed is the amount of technological know-how actually absorbed by firm i in year t from the outside and is measured as the number of patent classes cited by firm i in year t that do not overlap with classes firm i has patented in year t. The procedure of measuring the following variable is described in details in Narasimhan et al. (2006).

R&D intensity is measured as the amount of R&D expenditure for firm i for year t divided by its sales for that year.

Marketing intensity is defined as the amount of selling, general, administrative expenses for firm i for year t, divided by its sales for that year.

Innovation stock is the citation-weighted patent count of firm i in year t with accounting for the stock of knowledge $k = 1, \dots, 5$ years prior to the year t. Consistent with past literature (e.g., Narasimhan et al., 2006), we impose the declining weights of $\delta = 0.4^k$ on past innovative output. We eliminate the truncation bias by assuming that all possible patent citations can be captured within a five year period (Dutta & Weiss, 1997). All patent-related data on all companies were extracted from the Worldwide Patent Statistical database (PATSTAT), which covers patents issued by the United States Patent and Trademark Office (USPTO). We only use information on patents issued by the USPTO. Overall, we analyzed 183,361 patents granted to the firms in our sample. We did not find a statistically significant difference in the means of the citation-weighted patent count between software and other MNEs from the ICT industry in our sample.

Market conditions are dummy variables based on the primary four-digit SIC code of firm i.

Similar to Narasimhan et al. (2006), we impose distributional assumptions on the random shock, ε_{it}, and the inefficiency of absorbing know-how, η_{it}. We assume that $\varepsilon_{it} \overset{iid}{\sim} N(0, \sigma_\varepsilon^2)$ and $\eta_{it} \overset{iid}{\sim} N(\mu, \sigma_\eta^2)$, where $\mu > 0$ and $E[\varepsilon_{it}\eta_{it}] = 0$, which are the assumptions for the time-invariant stochastic frontier model (Battese & Coelli, 1988). Because absorptive capacity stands for the efficiency of absorbing know-how, we derive the measure of absorptive capacity from the estimate of the technical efficiency term, which, in turn, derived based on the estimate of η_{it} (Narasimhan et al., 2006). By using SFE to estimate know-how absorbed from equation (1), we can further derive the consistent estimate of η_{it} from the maximum likelihood estimates of the parameters μ, σ_ε, and σ_η.

Following Battese and Coelli (1988), we derive a consistent estimate of the technical efficiency term for firm i in year t is from

(2) $$E[\exp(-\eta_{it})\,|e_{it} = \hat{e}_{it}] = \left(\frac{1 - \Phi[\sigma^{*2} - (\mu_{it}^{*}/\sigma^{*2})]}{1 - \Phi(-\mu_{it}^{*}/\sigma^{*2})}\right)\exp(-\mu_{it}^{*} + \sigma^{*2}/2),$$

where

(3) $$\mu_{it}^{*} = \frac{\mu\sigma_{\varepsilon}^{2} - \sigma_{\eta}^{2}\hat{e}_{it}}{\sigma_{\varepsilon}^{2} + \sigma_{\eta}^{2}} \quad \text{and} \quad \sigma^{*2} = \frac{\sigma_{\varepsilon}^{2}\sigma_{\eta}^{2}}{\sigma_{\varepsilon}^{2} + \sigma_{\eta}^{2}}.$$

To obtain the measure of absorptive capacity, we further normalize this value (Narasimhan et al., 2006), i.e. we put it in the range between 0 and 1. The higher the technical efficiency, the higher the absorptive capacity of firm i in year t.

Control variables

We control for a number of alternative explanations on different levels of analysis. On the firm level, we control for: R&D intensity (the amount of a firm's R&D expenditures divided by its sales), export intensity (the amount of foreign sales divided by total sales), firm size (natural logarithm of total sales), firm age (natural logarithm of the number of years from incorporation plus one), product diversification (the sales-based Herfindahl-based index of industry diversity of a firm's business segments), and firm performance (return on assets). The data for these controls come from the Compustat North America database. On the firm level we also include a number of alliance portfolio controls, which come from both the SDC Platinum database and the 10-K fillings. The computation of alliance portfolio controls is based on the attributes of non-equity-based alliances, since equity-based alliances are treated as FDI. Alliance portfolio controls are: asset-adjusted alliance portfolio size (natural logarithm of the number of alliances divided by the firm's total assets), the ratio of ties to global (host-region) partners to total number of ties, and the ratio of ties to globally (host-regionally) experienced home country partners to total number of ties to home country partners. We equalize alliance portfolio controls to zero if a firm has not had any alliance activity in a given year. We also control for the presence of strong ties by dividing the number of equity alliances, joint ventures, and non-equity R&D alliances (Rowley et al., 2000) to the total amount of alliances that a firm has within the ICT industry. We use ratios to avoid the problem of multicollinearity, which arises from strong correlation between our alliance portfolio count variables.

Higher-level controls are set on network cluster, industry, country, and region levels. Network cluster controls include: cluster size (the number of firms within a network cluster) and cluster home-region alliance experience (the ratio of cluster members that have at least one tie to host-region partners to the total number of cluster members). On the industry level we control for industry globalization, using the intra-industry trade measure (Wiersema & Bowen, 2008). Intra-industry trade is used to capture the degree of global integration of industry value-added activities and is measured as $[(Exports_{jt} + Imports_{jt}) - Absolute\ value(Exports_{jt} - Imports_{jt})]\ /\ (Exports_{jt} + Imports_{jt})$, where j is one of four three-digit SIC codes. Another industry-level control is industry import penetration, measured as $Imports_{jt}\ /(Production_{jt} - Exports_{jt} + Imports_{jt})$. The data for computing industry globalization are taken from the International Trade Administration, which we combine with the U.S. Census Bureau data to compute industry import penetration. Finally, we control for the effects of any general economic event or trend in FDI activity (year dummies).

We mean-center our independent and moderation variables to facilitate interpretation of the effects. As already mentioned, we lag all the right-hand side variables one year with respect to the dependent variables to facilitate establishing the direction of causality.

RESULTS

Table 1 contains descriptive statistics and the correlation matrix. The estimation results are depicted in Table 2. We estimated the model with the method of generalized least squares (GLS), which allows us to correct for heteroskedasticity and panel-specific autocorrelation (‘xtgls’ command with ‘corr(psar1)’ and ‘panels(het)’ options, Stata 14). Having an estimation procedure that is able to correct for panel-specific autocorrelation is required, i.e. each panel is assumed to have errors that follow a different AR(1) process, because our panels are not characterized by the common AR(1) coefficient: in some of the panels the lagged values of home-region orientation are strong predictors of the current values, while in other panels this relationship is significantly weaker. We discuss alternative estimation procedures in the robustness checks section.

Insert Tables 1 and 2 about here

We test for potential multicollinearity in our models by deriving variance inflation factors (VIFs) for each model in Table 2. The average VIF value across all variables in the full model (Model 8) is equal to the critical value of 10 (Table 2), but individual VIFs of our mean-centered independent variables and their interactions have scores above 10. The high VIF values result from the strong correlations between the independent variables and their quadratic terms (Table 1). We thus follow prior research on strategic alliances and networks (e.g., Dushnitsky & Lavie, 2010; Lavie & Miller, 2008) and rely on the partial models in testing our hypotheses.

From Table 2, we can conclude that all of our hypothesized relationships are supported. Models 2 and 5 yield support for Hypothesis 1 with quadratic term for network range being significant at 1% level. In Model 5, the quadratic coefficient is positive ($\beta = 0.005, p < 0.01$), which strongly supports a U-shaped relationship. The coefficient of the linear term for network range is supported at 5% level ($\beta = -0.008, p < 0.05$). For mean-centered variables, it is enough that the quadratic term is significant. From Models 3 and 6, we conclude that Hypothesis 2 is strongly supported with both linear ($\beta = 0.061$) and quadratic ($\beta = 0.103$) terms being significant at 0.1% level (Model 6). The positive and significant linear term for brokerage signals the downward sloping curve in our case, because the measure for brokerage has been reversed-coded. Hypothesis 3 is also strongly supported at 0.1% level with linear and quadratic terms being equal to -0.079 and 0.097, respectively (Model 7).

As for the moderating role of absorptive capacity, by looking at the estimates of interactions between quadratic main effects and the moderator in Models 5, 6, and 7, we observe support for Hypotheses 4, 5, and 6, respectively. Even though by itself the coefficient of absorptive capacity is not strongly significant throughout all models with the moderation effects, absorptive capacity shows strong and significant influence on all of the quadratic main effects. The interaction estimates of absorptive capacity and quadratic network range ($\beta = -0.016$) are significant at 0.1% level, while those of quadratic brokerage ($\beta = -0.177$) and quadratic cluster density ($\beta = -0.347$) are both significant at 5% and 1% level, respectively. All estimates of quadratic interactions are lower than those of direct quadratic effects, thus, confirming the attenuated effects of the moderator. Figures 1a, 2a and 3a contain graphical representation of the direct effects of network range, brokerage, and density on home-region orientation. Figures 1b, 2b, and 3b show the moderating effects of absorptive capacity, where the U-shaped effects of network range, brokerage, and cluster density on home-region orientation are attenuated and even become inverted under high degrees of absorptive capacity. Horizontal axes on the figures, as well as the moderation term, contain meaningful values of the respective variables (i.e. ranging from a minimum to a maximum value).

From Figures 1b, 2b, and 3b, we observe that under- and over-embeddedness stimulate the global strategy development process while reducing home-region focus when firms possess strong absorptive capacity. MNE's own absorptive capacity tends to compensate for the insufficient network connectedness when developing non-location-bound FSAs. At the high levels of structural embeddedness, absorptive capabilities allow firms to utilize external knowledge more efficiently and effectively, thus, lowering boundedness to a specific location by releasing time and resources otherwise utilized to understand how to extract benefits from the network.

Insert Figures 1a, 1b, 2a, 2b, 3a, and 3b about here

As for the control variables, we find the consistent support for R&D intensity, export intensity, firm size, firm age, product diversification, firm performance, industry globalization, industry import penetration, and asset-adjusted alliance portfolio size. Our estimates of R&D intensity, export intensity, firm size, firm age, product diversification, firm performance, and industry globalization do not significantly differ from the effects hypothesized in the previous studies on home-region orientation and international diversification. We find that greater degrees of R&D intensity, export intensity, firm size, firm performance, and industry globalization correspond to drop in home-region orientation, while firm age, and product diversification lead to its increase. We also observe significant support for the effect of industry import penetration on home-region orientation. Contrary to Wiersema and Bowen (2008) who argue that competition from foreign firms should challenge domestic firms to become more competitive at a global level, we find a positive association between home-region orientation and industry import penetration. When threatened by foreign-based competition, MNEs may reduce the geographical diversity of their FDI and redirect them to protect their home country positions. The positive and significant relation between asset-adjusted alliance portfolio size and home-region orientation may implies that, when combined with insufficient internal capabilities, multiple direct linkages can be counterproductive and may limit firm's potential to generate sufficient non-location-bound FSAs, which leads to a more regional focus in international expansion strategies.

Robustness checks

We performed robustness checks to test the sensitivity of our results to changing ownership structures of FDIs, using different region classifications and estimation procedures, and different operationalization of our independent variables. First, we redefined FDIs as majority-owned foreign entities, i.e. entities with ownership percentage of more than 50%. We found similar support for all the hypotheses as with the 10% threshold. Then, we included only wholly-owned subsidiaries, i.e. set a 100% ownership threshold, and still find support for the same set of the hypotheses.

Second, the significance of our results remains the same whether we define home region as NAFTA (Rugman & Verbeke, 2004) or the Americas. However, if we apply a cultural taxonomy of the world in which the U.S. is nested within the Anglo-Saxon region (with Canada, the U.K., Australia, Ireland, and New Zealand), we find that only Hypotheses 2 and 5 remain strongly supported. This is a very interesting observation that supports the notion that the ability to gain benefits from brokerage is context specific (Xiao & Tsui, 2007). When redefining regions, we also adjust the set of region-related control variables to the corresponding region taxonomy.

Third, we apply alternative estimation models. We run a hierarchical linear model (HLM), where temporal variation (level 1) is nested within firms (level 2), which are nested within network clusters (level 3). Firms that have not been a member of the domestic alliance network, are assigned to a separate artificial "non-membership" cluster. Relying on partial models, we find strong support for all of our hypothesized effects except for Hypothesis 4, which is supported at the 10% level. The HLM estimates are presented in Table 3. Note, however, that the rationale for incorporating more than two levels is confined by the lack of additional variance explained by introducing the network cluster levels. We also run pooled ordinary least squares (OLS) regression with Driscoll and Kraay (1998) standard errors, which are robust to heteroscedasticity, autocorrelation and cross-sectional dependency (Hoechle, 2007). The OLS regressions produce very similar results to the other estimations.

Insert Table 3 about here

We also use different operationalizations for our independent variables that take into account indirect ties. Instead of using information centrality to proxy network range, we use a closeness centrality measure, which computation is based on the average reciprocal of the lengths of the geodesic paths (Freeman, 1979). We find support for the direct U-shaped effect of this measure and for its moderation by absorptive capacity. In addition, we use eigenvector centrality (Bonacich, 1987) to proxy network range. We observe support for the direct effects, but not for the moderation. Eigenvector centrality is normally used to measure status and it often neglects embeddedness within local structures. We also run regressions with the betweenness centrality measure (Freeman, 1979). We find support for both the main effect of betweenness centrality and its moderation by absorptive capacity in the interaction effect model. Lastly, we use different clustering algorithms to partition the overall network into smaller communities. In particular, we use the Markov Cluster algorithm (Van Dongen, 2000), which produces subnetworks by finding common patterns of random walks on a graph. We observe that when network partitioning is strict, i.e. a clustering procedure produces less inclusive clusters, the effects of density disappears.

We test the effects of domestic overembeddedness on MNEs' geographic scope across several dimensions of structural network embeddedness. We introduced a three-way interaction, which encompasses all network variables, i.e. network range, brokerage, and cluster density. The term is positive yet significant at the 10% level. The interaction indicates that network overembeddedness strengthens home region orientation, which is indeed consistent with our general theoretical assumption.

Finally, as can be noted from Table 1, the correlation between firm size and absorptive capacity is 0.64. The observation is consistent with the view that the leading firms are more capable to source tacit knowledge and extract maximum benefits even under limited embeddedness (Cantwell & Mudambi, 2011; see also Cantwell & Santangelo, 1999). Firm size could hence be regarded as a possible alternative operationalization of absorptive capacity. All interactions of our network variables with firm size are strongly significant with firm size attenuating the effects of network variables on home-region orientation. However, despite changing the shape, the curve shifts itself downwards, meaning that bigger firms are less dependent on network resources when internationalizing than their smaller counterparts. With our initial operationalization of the absorptive capacity variable (efficiency of absorbing know-how), it is not always the case that the shape itself shifts downwards (Figures 1b, 2b, and 3b). For network range and cluster density, we find that MNEs with moderate degrees of network embeddedness and stronger absorptive capacity are more inclined to exploiting opportunities regionally rather than globally as opposed to MNEs with weaker absorptive capacity. Therefore, both operationalizations produce rather similar yet conceptually different moderating effects on the propensity to expand within the home region as opposed to outside the home region.

DISCUSSION AND CONCLUSION

The overall motivation of this paper was to advance our understanding of home-country factors influencing the development of FSAs and the geographic scope of MNEs. Successful implementation of international expansion strategies is not only due to the exploitation of FSAs in geographically dispersed subsidiaries – it is also a function of non-location-bound FSAs developed in the MNEs' domestic (home country) environment (Buckley & Casson, 1976). The literature suggests that foreign subsidiaries play a role in the accumulation and recombination of knowledge (Kogut & Zander, 1993; Un, 2016) and its reverse transfer to corporate headquarters (Blomkvist, Kappen, & Zander, 2010; Cantwell & Mudambi, 2005; Meyer, Mudambi, & Narula, 2011; Mudambi & Navarra, 2004). A key question though is whether these FSAs can be readily deployed and exploited beyond a host location's borders without adequate access to external resources and without advanced – and hence typically complex – systems for knowledge development and diffusion (Rugman & Verbeke, 2007). Particularly in a high-tech context, the assumption that the majority of capability development of the MNE is continuously taking place in the home country and then exploited abroad can be particularly strong. R&D is among the least internationalized activities of firms. According to 2005 World Investment Reports from UNCTAD (2005), only 13% of US MNEs' R&D spending originates from outside the US. Likewise, more than three fourths of all external knowledge sourced through strategic alliances appears to be domestic (US software industry; Lavie & Miller, 2008), and extensively spread out R&D activities tend to reduce the quality of innovation (Lahiri, 2010). Even though MNEs' foreign subsidiaries innovate and create competences (Un, 2016), such competences are not always "digested" by the headquarters and are not guaranteed to be utilized elsewhere (Athreye, Tuncay-Celikel, & Ujjual, 2014). Development of non-location-bound FSAs may strongly depend on nets of collocated interorganizational ties (Bell & Zaheer, 2007), which makes the home country context a strong predictor of international diversification.

Specifically, this study advances our understanding of the role of access to information and knowledge in home country alliance network structures for the geographic scope of MNEs. We investigate how varying access to network resources leverages MNEs' resource deployment across borders, which consequently forms their choices regarding international expansion strategy. We proxy differences in MNEs' access to home country social capital, and thus in their access to resource and information flows, by measuring variation in network range, brokerage, and the density of ties within which they are embedded. In addition, we examine the moderating role of individual MNEs' absorptive capacity for recognizing and assimilating new information and knowledge and thus, creating an edge for themselves in host regions.

We find that MNEs' propensity to expand within the home region rather than outside the home region has a curvilinear (U-shaped) relationship with network range, brokerage, and cluster density. This supports the argument that beyond a certain threshold home country network embeddedness drives MNEs to set a narrower geographic scope. Additionally, we find that the MNE's individual absorptive capacity attenuates, and even reverts, the relationship between geographic scope and all considered structural network indicators. This is a non-trivial observation, which emerges from the imposed boundary condition. We observe that MNEs with moderate degrees of network embeddedness and stronger absorptive capacities are more inclined to exploit opportunities regionally rather than globally, as opposed to MNEs with weaker absorptive capacities. Although this observation goes against our initial theoretical prediction, it lines up with the general idea that the control and coordination costs of global diversification have to be related to the potential benefits that MNEs can extract from more proximate and familiar environments, such as home regions (Qian et al., 2010; Qian et al., 2008; Rugman & Verbeke, 2007). MNEs with stronger absorptive capacities and moderate degrees of structural network embeddedness can achieve considerably greater benefits from first developing and exploiting their FSAs within the environment with a suitable set of institutional and economic conditions. The home region provides significant efficiency effects for these firms (Lorenzen & Mudambi, 2013), in the sense that they can profitably exploit their non-location-bound FSAs and gain a competitive advantage without the need for substantial investments in home region-specific adaptation or the subsequent development of non-location-bound FSAs through networks. Moreover, location-bound FSAs developed and exploited by MNEs with strong absorptive capacity in their home country can be adjusted to be fully deployable in the entire home region, with low investments in adjustment required (Rugman & Verbeke, 2005).

However, our findings suggest that the tendency of MNEs with strong absorptive capacity to exploit opportunities regionally rather than globally is temporal, and subsequent advances in home country network positions change the shape of the curve towards a global orientation. This finding implies that such MNEs do not continuously consider regional expansion as the best solution of their internationalization process, but would rather see it as a process toward globalization. Global success does not result from simple deployment of non-location-bound FSAs in distant markets, but more likely from the continuous investments by MNEs in the development of location-bound FSAs to complement existing non-location-bound FSAs, or in the development of new non-location-bound FSAs (Rugman & Verbeke, 2005). Hence, for MNEs with strong absorptive capacity, subsequent advances in the home country network positions are likely to promote the development of new non-location-bound FSAs, which will propagate MNEs globally. In other words, non-location-bound FSAs developed by MNEs with strong absorptive capacity and extensive external access to information, knowledge, and asset flows will outweigh the LOF (Zaheer, 1995) and trigger interregional expansion. So-called shape-flips (i.e. the reverse of a curvilinear relationship) that occur within the range of the moderator, signals the moderator's vital effect on the relationship between the dependent and independent variables (Haans, Pieters, & He, 2016).

The observed substantial moderating effects of absorptive capacity suggest that it should be worthwhile examining other organizational and individual factors that address the complexity associated with boundary spanning and which may delineate the extent of MNEs' geographic scope. Schotter et al. (2017) specifically point to the possible key role of boundary spanners, i.e. organizational members who play active and decisive roles for engaging externals actors with the aim to work out solutions for dealing with significant external threats and opportunities. The availability of boundary spanners can be crucial for the relationship between MNEs' network positions and their geographic scope.

Our theoretical and empirical frameworks could certainly be refined and extended in future studies. First, we consider a sample of U.S. MNEs within the ICT industry. Further research could investigate whether the hypothesized relationships and effect sizes also hold within a sample of European or Asian MNEs, as well as within different industry set ups. Second, as we focus on the FDI behavior of MNEs, different market expansion strategies (e.g., sales-based foreign market expansion) could also be studied to establish the generalizability of our findings. Third, our results rely on a regional taxonomy that is based on the idea of geographic distance and market integration. From the robustness checks, we find that some results are sensitive to regrouping regions according to a cultural, instead of a geographic, domain. Future research should therefore explore the effects of home country network structures under different conceptual taxonomies of regions, particularly those emphasizing cultural, administrative, or economic (i.e. differences between rich and poor groups of companies) characteristics (Ghemawat, 2001). Similarly, the influence of other structural network variables and their interactions on MNEs' propensities to expand within rather than outside the home region could also be examined. Fourth, we capture how networks of ongoing interfirm collaborations affect firms' geographic scope regardless of their positioning in the existing geographic clusters. Future research may investigate how firms develop competitive advantages and internationalize given their joint positioning in both geographic and topological clusters. Finally, even though we provided a set of conceptual arguments of how domestic networks affect firm geographic scope and how absorptive capacity moderates this relationship, it is difficult to decompose the mechanism empirically. In reality, networks could include various types of FSAs, but not all. Our empirical approach has therefore been to control for other types of FSAs beyond those we capture with networks and absorptive capacity.

NOTES

[1] Apart from firm- and cluster-level variables, the interorganizational networks literature identifies whole network-level variables, such as density, fragmentation, governance, and centralization (see Provan et al. (2007) for the review of the empirical literature on interorganizational networks). However, in this paper we focus on only one network and, thus, do not observe any cross-sectional variation in whole network variables.

[2] While network status is operationalized via eigenvector centrality (Guler & Guillén, 2010; Lin, Yang, & Arya, 2009), network range can be captured by closeness centrality measures (Powell et al., 1996; Tortoriello et al., 2012). Closeness centrality allows to consider indirect passages of information and knowledge flows to other firms. For example, degree centrality only emphasizes the importance of direct connections. Nevertheless, we discuss results for eigenvector centrality in the robustness checks section.

[3] In line with the existing literature (e.g., Ahuja, 2000; Guler & Guillén, 2010; Shi et al., 2014; Xiao & Tsui, 2007), we capture brokerage with more local measures, such as network constraint (Burt, 1992). A more global measure of brokerage is betweenness centrality (Freeman, 1979), which is associated with control over key information and assets in the whole network. We discuss results for betweenness centrality in the robustness checks section.

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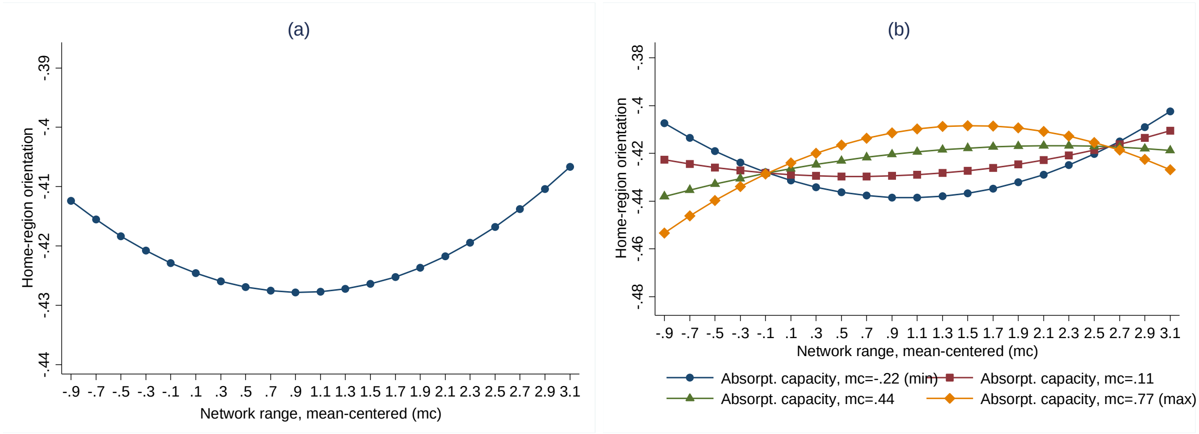

Figure 1. Direct effect of network range (a) and moderating effect of absorptive capacity (b)

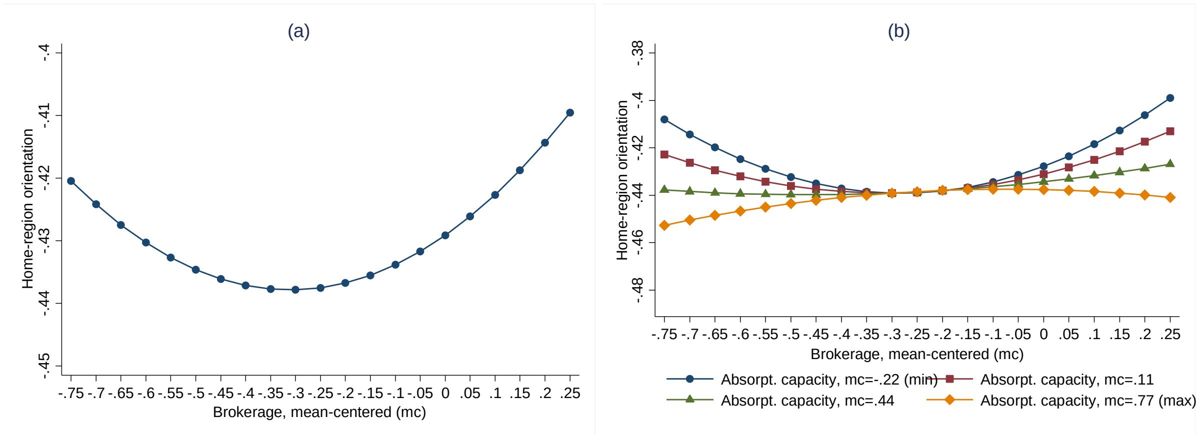

Figure 2. Direct effect of brokerage (a) and moderating effect of absorptive capacity (b)

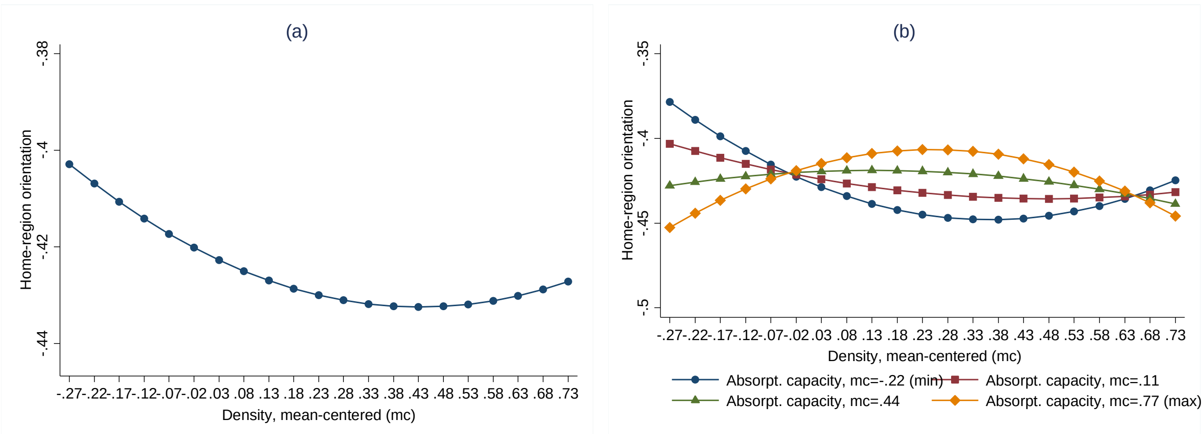

Figure 3. Direct effect of cluster density (a) and moderating effect of absorptive capacity (b)

Table 1. Correlation matrix

	Mean	S. D.	1	2	3	4	5	6	7	8	9
1. Home-region orientation	-0.40	0.28									
2. R&D intensity	0.17	0.16	-0.07***								
3. Export intensity	0.42	0.26	-0.46***	0.09***							
4. Firm size	5.38	1.83	-0.27***	-0.27***	0.28***						
5. Firm age	3.04	0.70	-0.02	-0.33***	0.14***	0.31***					
6. Product diversification	0.22	0.28	0.06**	-0.20***	-0.04†	0.35***	0.31***				
7. Firm performance	-0.08	0.49	-0.03	-0.28***	0.06**	0.13***	0.17***	0.00			
8. Industry globalization	0.70	0.22	-0.12***	0.02	0.42***	0.15***	0.16***	-0.03	0.05*		
9. Industry import penetration	0.22	0.22	0.10***	-0.08***	0.13***	0.00	0.16***	0.05*	0.03	0.38***	
10. % strong ties	0.04	0.15	-0.05**	-0.01	0.09***	0.20***	0.05*	0.09***	0.02	0.11***	0.03
11. Portfolio size	0.02	0.06	0.10***	0.16***	-0.12***	-0.27***	-0.09***	-0.03	-0.18***	-0.16***	-0.15***
12. % alliances to global partners	0.18	0.30	-0.14***	0.00	0.13***	0.21***	0.09***	0.11***	0.01	0.00	-0.02
13. % alliances to globally experienced domestic partners	0.22	0.35	-0.13***	0.05*	0.11***	0.31***	0.00	0.13***	-0.01	-0.08***	-0.13***
14. Cluster size	20.90	43.44	-0.10***	0.04*	0.03	0.29***	-0.02	0.13***	-0.02	-0.10***	-0.16***
15. Cluster global alliance experience	0.15	0.22	-0.12***	0.04†	0.08***	0.29***	0.00	0.14***	0.01	-0.11***	-0.17***
16. Absorptive capacity	0.24	0.21	-0.23***	-0.01	0.34***	0.64***	0.21***	0.24***	0.07***	0.33***	0.15***
17. Network range	0.90	1.27	-0.11***	0.07***	0.00	0.30***	-0.06**	0.14***	-0.04*	-0.16***	-0.24***
18. Network range^2	2.42	4.32	-0.03	0.07***	-0.03	0.17***	-0.07***	0.10***	-0.07***	-0.06**	-0.12***
19. Brokerage	-0.25	0.38	0.05**	-0.05**	0.00	-0.05*	0.05**	-0.01	0.01	0.10***	0.12***
20. Brokerage^2	0.20	0.37	0.00	0.02	0.00	-0.04*	-0.02	-0.02	0.00	-0.01	0.00
21. Cluster density	0.13	0.30	-0.01	0.03	0.01	0.00	-0.02	0.01	0.01	-0.06**	-0.05**
22. Cluster density^2	0.10	0.30	-0.01	0.02	0.02	-0.02	-0.01	-0.01	0.01	-0.01	-0.01

Table 1. Correlation matrix (continued)

	10	11	12	13	14	15	16	17	18	19	20	21
11. Portfolio size	0.00											
12. % alliances to global partners	0.17***	0.08***										
13. % alliances to globally experienced domestic partners	0.23***	0.08***	0.13***									
14. Cluster size	0.32***	0.14***	0.13***	0.54***								
15. Cluster global alliance experience	0.31***	0.14***	0.37***	0.55***	0.50***							
16. Absorptive capacity	0.25***	-0.13***	0.20***	0.29***	0.27***	0.28***						
17. Network range	0.35***	0.20***	0.16***	0.64***	0.78***	0.69***	0.28***					
18. Network range^2	0.31***	0.15***	0.05*	0.46***	0.70***	0.36***	0.18***	0.82***				
19. Brokerage	-0.19***	-0.15***	-0.14***	-0.37***	-0.27***	-0.62***	-0.06**	-0.51***	-0.13***			
20. Brokerage^2	0.10***	0.06**	0.07***	0.18***	0.05**	0.38***	-0.01	0.22***	-0.05**	-0.90***		
21. Cluster density	0.09***	0.11***	0.12***	0.00	-0.14***	0.39***	0.02	0.10***	-0.23***	-0.72***	0.68***	
22. Cluster density^2	0.07***	0.07***	0.09***	-0.07***	-0.14***	0.26***	0.00	0.00	-0.23***	-0.59***	0.61***	0.92***

N = 2718. † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2. GLS model estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Home-region orientation$_{t+1}$				
R&D intensity$_t$	-0.070***	-0.067***	-0.065***	-0.066***	-0.060***	-0.069***	-0.066***	-0.074***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.016)
Export intensity$_t$	-0.252***	-0.244***	-0.249***	-0.251***	-0.238***	-0.253***	-0.250***	-0.250***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Firm size$_t$	-0.033***	-0.032***	-0.031***	-0.031***	-0.031***	-0.031***	-0.030***	-0.030***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm age$_t$	0.032***	0.034***	0.034***	0.033***	0.032***	0.032***	0.035***	0.029***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Product diversification$_t$	0.029***	0.033***	0.032***	0.030***	0.033***	0.033***	0.029***	0.039***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Firm performance$_t$	-0.008**	-0.007**	-0.007**	-0.007**	-0.007**	-0.007**	-0.008***	-0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Industry globalization$_t$	-0.059***	-0.054***	-0.060***	-0.060***	-0.057***	-0.063***	-0.057***	-0.050***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Industry import penetration$_t$	0.138***	0.124***	0.126***	0.139***	0.139***	0.129***	0.110***	0.148***
	(0.015)	(0.015)	(0.015)	(0.014)	(0.016)	(0.014)	(0.014)	(0.016)
% strong ties$_t$	0.009	0.006	0.012	0.011	0.002	0.012	0.015	0.013
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)
Portfolio size$_t$	0.180***	0.212***	0.223***	0.201***	0.237***	0.230***	0.210***	0.246***
	(0.040)	(0.036)	(0.037)	(0.039)	(0.036)	(0.038)	(0.038)	(0.040)
% alliances to global partners$_t$	-0.002	-0.001	-0.002	-0.003	-0.001	-0.002	-0.002	0.000
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
% alliances to globally experienced domestic partners$_t$	-0.012*	-0.008	-0.008	-0.011†	-0.010	-0.007	-0.011†	-0.006
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Cluster size$_t$	0.000	-0.000	0.000	-0.000	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cluster global alliance experience$_t$	-0.009	0.010	0.010	0.000	0.006	0.008	0.005	0.016
	(0.008)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)

Table 2. GLS model estimates (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Absorptive capacity$_t$		-0.032†	-0.034*	-0.025	0.004	-0.010	0.008	0.007
		(0.017)	(0.016)	(0.017)	(0.018)	(0.020)	(0.019)	(0.025)
Network range$_t$		-0.009*			-0.008*			-0.019*
		(0.004)			(0.004)			(0.008)
Network range$_t^2$		0.005**			0.005**			0.008**
		(0.002)			(0.002)			(0.003)
Brokerage$_t$			0.056***			0.061***		-0.018
			(0.013)			(0.014)		(0.035)
Brokerage$_t^2$			0.090***			0.103***		0.024
			(0.022)			(0.024)		(0.042)
Cluster density$_t$				-0.052**			-0.079***	-0.045
				(0.017)			(0.019)	(0.028)
Cluster density$_t^2$				0.060**			0.097***	0.039
				(0.022)			(0.025)	(0.029)
Absorptive capacity$_t$ × Network range$_t$					0.041***			0.081***
					(0.011)			(0.023)
Absorptive capacity$_t$ × Network range$_t^2$					-0.016***			-0.029***
					(0.005)			(0.008)
Absorptive capacity$_t$ × Brokerage$_t$						-0.086†		0.190†
						(0.050)		(0.107)
Absorptive capacity$_t$ × Brokerage$_t^2$						-0.177*		0.128
						(0.089)		(0.143)
Absorptive capacity$_t$ × Cluster density$_t$							0.213*	0.052
							(0.087)	(0.106)
Absorptive capacity$_t$ × Cluster density$_t^2$							-0.347**	-0.084
							(0.117)	(0.129)
Constant	-0.238***	-0.270***	-0.275***	-0.259***	-0.274***	-0.269***	-0.276***	-0.278***
	(0. 019)	(0.020)	(0.020)	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)
Wald χ^2 (overall model fit)	1708***	1864***	1953***	1778***	1767***	1976***	1860***	1668***
Incremental change (Wald χ^2 for coefficients)		13.15$^{**(a)}$	22.25$^{***(a)}$	12.13$^{**(a)}$	14.17$^{***(b)}$	4.11$^{(b)}$	11.23$^{**(b)}$	41.43$^{***(a)}$
Average VIF	1.54	2.33	2.69	2.41	2.75	3.19	3.88	10.21

N = 2416. Year dummies are included but not reported. Standard errors in parentheses. † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
(a) Improvement towards the model with controls only. (b) Improvement towards the model with corresponding independent variables only.

Table 3. HLM model estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Home-region orientation$_{t+1}$							
R&D intensity$_t$	-0.084***	-0.084***	-0.084***	-0.085***	-0.086***	-0.084***	-0.086***	-0.085***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.014)
Export intensity$_t$	-0.272***	-0.276***	-0.271***	-0.273***	-0.278***	-0.272***	-0.273***	-0.280***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.015)
Firm size$_t$	-0.029***	-0.028***	-0.030***	-0.030***	-0.030***	-0.030***	-0.030***	-0.029***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Firm age$_t$	0.019**	0.017*	0.017*	0.019**	0.017*	0.016*	0.019**	0.013
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
Product diversification$_t$	0.065*	0.064*	0.063*	0.064*	0.062*	0.064*	0.067*	0.064*
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.033)	(0.033)
Firm performance$_t$	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Industry globalization$_t$	-0.002	-0.010	-0.007	-0.006	-0.009	-0.005	-0.004	-0.003
	(0.018)	(0.016)	(0.019)	(0.018)	(0.016)	(0.021)	(0.019)	(0.018)
Industry import penetration$_t$	0.126***	0.116***	0.110***	0.125***	0.114***	0.109***	0.121***	0.101**
	(0.028)	(0.030)	(0.029)	(0.028)	(0.030)	(0.029)	(0.028)	(0.035)
% strong ties$_t$	0.035†	0.040†	0.041†	0.036†	0.035	0.043†	0.040*	0.044†
	(0.021)	(0.023)	(0.021)	(0.019)	(0.024)	(0.023)	(0.020)	(0.026)
Portfolio size$_t$	0.188**	0.217***	0.230***	0.194**	0.225***	0.235***	0.195***	0.233***
	(0.065)	(0.065)	(0.056)	(0.061)	(0.061)	(0.051)	(0.059)	(0.056)
% alliances to global partners$_t$	-0.025***	-0.030***	-0.029***	-0.025***	-0.031***	-0.030***	-0.028***	-0.033***
	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)	(0.006)	(0.006)	(0.007)
% alliances to globally experienced domestic partners$_t$	-0.012	-0.004	-0.009	-0.011	-0.003	-0.010	-0.011	-0.005
	(0.017)	(0.020)	(0.016)	(0.018)	(0.020)	(0.015)	(0.017)	(0.020)
Cluster size$_t$	-0.000	-0.000	-0.000	-0.000*	-0.000	-0.000	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cluster global alliance experience$_t$	0.011	0.066**	0.049	0.022	0.066**	0.052†	0.035	0.072**
	(0.019)	(0.023)	(0.032)	(0.031)	(0.023)	(0.031)	(0.028)	(0.025)
Absorptive capacity$_t$		0.006	0.000	0.004	0.023	0.044	0.044	0.052
		(0.021)	(0.021)	(0.021)	(0.034)	(0.035)	(0.030)	(0.041)

Table 3. HLM model estimates (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Network range$_t$		-0.031***			-0.032***			-0.061**
		(0.009)			(0.009)			(0.022)
Network range$_t^2$		0.010**			0.010**			0.021***
		(0.003)			(0.003)			(0.006)
Brokerage$_t$			0.142***			0.144***		-0.067
			(0.036)			(0.036)		(0.082)
Brokerage$_t^2$			0.241***			0.247***		-0.005
			(0.055)			(0.055)		(0.106)
Cluster density$_t$				-0.060			-0.111**	-0.063
				(0.048)			(0.039)	(0.047)
Cluster density$_t^2$				0.072			0.142**	0.066
				(0.055)			(0.045)	(0.051)
Absorptive capacity$_t$ × Network range$_t$					0.050**			0.182***
					(0.017)			(0.032)
Absorptive capacity$_t$ × Network range$_t^2$					-0.019†			-0.073***
					(0.010)			(0.014)
Absorptive capacity$_t$ × Brokerage$_t$						-0.088		0.500**
						(0.115)		(0.160)
Absorptive capacity$_t$ × Brokerage$_t^2$						-0.361*		0.480*
						(0.179)		(0.239)
Absorptive capacity$_t$ × Cluster density$_t$							0.215	0.107
							(0.175)	(0.202)
Absorptive capacity$_t$ × Cluster density$_t^2$							-0.532*	-0.303
							(0.231)	(0.276)
Constant	-0.262***	-0.276***	-0.288***	-0.263***	-0.270***	-0.285***	-0.267***	-0.283***
	(0.035)	(0.034)	(0.035)	(0.037)	(0.035)	(0.034)	(0.037)	(0.036)
Random effects (variance components)$^{(a)}$								
Level 3: Network cluster	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Level 2: Company	0.035***	0.035***	0.035***	0.035***	0.035***	0.035***	0.035***	0.034***
Level 1: Year (Residual)	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
Log-likelihood	970.665	975.823	978.073	971.879	977.507	981.064	977.166	993.071
Incremental change (LR ratio χ^2)		10.32$^{*(b)}$	14.82$^{**(b)}$	2.43$^{(b)}$	3.37$^{(c)}$	5.98$^{*(c)}$	10.57$^{**(c)}$	44.81$^{***(b)}$

N = 2416. Year dummies are included but not reported. Robust standard errors in parentheses. † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
(a) Likelihood-ratio tests for additional levels (i.e. Level 2 on top of Level 1, and Level 3 on top of both Level 2 and Level 1)
(b) Improvement towards the model with controls only. (c) Improvement towards the model with corresponding independent variables only.