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INNOVATION IN A GLOBAL CONSULTING FIRM: WHEN THE PROBLEM IS TOO MUCH DIVERSITY

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This paper explores how individual managers in multinational firms utilize their informal relations to create new knowledge. Specifically, how does the density of informal networks affect an actor's ability to access and integrate diverse information and consequently that actor's innovation performance? The arguments are developed using the setting of 79 senior partners in a global management consulting firm and tested on a dataset of 1,449 informal relationships. I distinguish between internal, external, local, and global relations and find that this separation permits a more nuanced understanding of the effect of network structure on innovation performance. Specifically, I argue that the most effective network strategy is contingent upon the context in which the partners operate. The findings show that partners operating in homogeneous contexts, where the primary challenge is to access diverse information, benefit from low-density networks. In contrast, when crossing both firm and geographic boundaries, partners with dense networks have higher innovation performance. I argue that in such heterogeneous contexts, dense network interactions facilitate partners' ability to integrate the diverse information to which they are exposed. Copyright © 2010 John Wiley & Sons, Ltd.

INTRODUCTION

Innovation is one of the cornerstones of continued growth and sustainable competitive advantage in large global firms (Doz, Santos, and Williamson, 2001). Knowledge creation has been addressed extensively in research on the multinational enterprise (MNE) as these firms are in a unique position to benefit because the complexity of the environment they operate in provides them with the potential to create new knowledge (e.g., Almeida, Song, and Grant, 2002; Kogut, 1985; Ghoshal and Bartlett, 1988; Prahalad and Doz, 1987). Indeed, one of the main advantages of operating in a global context is exposure to the diverse information and practices that comes with operating across different national contexts (Bartlett and Ghoshal, 1989; Westney and Zaheer, 2008). Yet while operating in a global context provides the potential for creating new knowledge and although vital to MNE success; continuous innovation is one of the main concerns and struggles of senior managers in MNEs (Andrew *et al*., 2008; Barsh, Capozzi, and Davidson, 2008).

In particular, as information and practices become more dispersed—for example through separation by geographic or firm boundaries—it becomes increasingly difficult and costly to integrate, and therefore more problematic to create new knowledge (Maskell, 2001; Teece, 1977). Sharing knowledge across geographic boundaries is particularly complicated because it requires managers to operate across spatial distances, as

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well as cultural and national differences (Barkema and Vermeulen, 1997; Hansen and Løvås, 2004). As the spatial distance increases, managers are less likely to interact as it becomes more work to do so (Allen, 1977).

Yet one of the ways in which managers might overcome some of these challenges of knowledge creation across geographies is by relying on interactions in their informal networks (e.g., Almeida *et al*., 2002; Hansen and Løvås, 2004; McEvily and Zaheer, 1999). In particular; senior managers in MNEs have responsibilities that allow for interaction with colleagues and clients that operate in contexts very different from their own. As a consequence, they will be exposed to diverse information and work practices. They can potentially take this diverse information and these practices and bring them to use in the local context, either through direct transfer or through recombination with existing knowledge, to create new knowledge (Kogut and Zander, 1992).

Although previous research has recognized that the MNE provides an environment both of opportunities for and barriers to knowledge creation, how individual managers most effectively create new knowledge has not been fully addressed. Extant work has tended to focus on knowledge transfers between MNE subsidiaries (e.g., Birkinshaw, 1997; Gupta and Govindarajan, 2000; Szulanski, 1996; Tsai, 2001) or have aggregated the level of analysis to the firm (e.g., Ahuja, 2000; McEvily and Zaheer, 1999). Nevertheless, most actual exchanges of information and practices in MNEs take place between individuals (Haas, 2006; Ghoshal, Korine, and Szulanski, 1994; Song, Almeida and Wu, 2003). Moreover, knowledge sharing across these firms is often assumed to take place through formal coordination mechanisms such as knowledge management systems, standard operating procedures, and routines as opposed to in the exchanges between people (Nohria and Ghoshal, 1997; Martinez and Jarillo, 1989). This dominant focus on formal mechanisms, as well as the aggregation of the level of analysis, thus leaves out consideration of the individual manager (see Birkinshaw and Pedersen, 2008; Foss and Pedersen, 2004). We therefore know little about how individual managers in global firms create new knowledge.

Organization scholars, however, have explored individual-level effects of network structure on innovative capability in large firms (e.g., Burt, 2004; Ibarra, 1993; Obstfeld, 2005). This work has built on the notion that innovations are novel combinations of existing information and work practices and assumes these to be disparate (Burt, 2004; Obstfeld, 2005). Thus, access to diverse information may arise from lack of connections between contacts in an actor's network (e.g., Reagans and Zuckerman, 2001; Reagans and McEvily, 2003; Ruef, 2002). Specifically, when the contacts in an actor's network are disconnected, there are no information exchanges between them, and consequently actors are assumed to reach different knowledge domains. Rodan and Galunic (2004) showed that while network structure is indeed correlated with access to diverse information, measuring the actual heterogeneity of knowledge may be a better indicator of innovation performance. Thus, it is unclear which network structures in reality lead to access to diverse information and knowledge.

Moreover, in order to be able to create new knowledge, the diverse information, knowledge, and practices also need to be integrated (Carlile and Rebentisch, 2003; Eisenhardt and Santos, 2002). Thus, for individual managers to be innovative requires them not only to *access* new and novel information and practices but also to successfully *integrate* this information and these practices. To integrate diverse information, actors might benefit from more connectedness between the contacts in their network (Obstfeld, 2005; Tortoriello and Krackhardt, 2010). Thus, there seems to be a competing tension in terms of network strategies between, on the one hand, being able to access new and novel information and knowledge, and, on the other hand, successfully integrating this information and knowledge; that is, whereas an open network may lead to diverse information, a more closed network is needed for integration of the same.

In this paper, I seek to resolve this tension by developing a contingency perspective for which network structure might be more helpful for innovation performance in global firms. The main premise is that the structure of connections between the different informal relations in a MNE manager's network will affect that manager's innovation performance. And, moreover, the most effective network structure depends on the heterogeneity of the context in which that manager operates. I argue that in homogeneous contexts, for example inside the firm, the biggest challenge to innovation that managers face is access to diverse

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information and knowledge. In that context, managers will benefit from low density of connections between the contacts in their networks. In such an open network, it is more likely that the contacts connect into different areas of information and knowledge, thus allowing the manager exposure to diverse information and knowledge. On the contrary, when operating in heterogeneous contexts across firms or geographies, managers will automatically be exposed to diverse information and knowledge. Here the challenge is not access to diverse information and knowledge, but rather how to integrate it. In that setting, managers benefit from dense network connections, which facilitate the interpretation and integration of diverse information and knowledge.

The arguments are developed in one particular setting, namely that of senior partners in a global management consulting firm. In this setting the individual manager's need to continuously innovate is particularly salient. Moreover this study is appropriate as the partners face both internal and external demands on their time; they are expected to develop new business externally and simultaneously draw on internal resources to implement this business. These partners operate across geographies and are thus likely to be exposed to heterogeneous information and knowledge. Finally, they rely heavily on their informal relations to be successful in their work. I draw on in-depth interviews with 32 partners in this firm and test the hypotheses on a unique data set of 1,449 informal relationships from a network survey of 79 senior partners based in 10 major offices across the United States, Europe, and Asia.

To preview the results, I find that, as expected, partners with low density of connections in their internal network have higher innovation performance. Similarly, in the external network among client contacts, low density is positively associated with high innovation performance. These findings support extant work linking open networks with access to heterogeneous knowledge. On the contrary, when bridging the external boundary of the firm to connect the internal and external networks, the findings are more surprising. There is no significant relationship of the density of connections between the internal network and the external contacts in the local environment. Nevertheless, partners benefit from more dense connections between the internal contacts and the external contacts *outside* the local environment. This result suggests that—at least in this setting—it is only when crossing both the firm and geographic boundaries that integration of heterogeneous knowledge becomes a challenge greater than access to the same; the partners therefore benefit from dense network interactions. Hence, these findings contribute to extant theory on network structures and innovation by showing that the optimal network strategy for innovation depends on the heterogeneity of the context in which the individual manager operates.

In the next section I draw on previous work on knowledge sharing in MNEs and network structure and innovation performance to develop the theory. I distinguish between different network ties and explicate how the context facilitates or hinders access to and integration of diverse information. Based on this distinction, I develop hypotheses about the effect of network structure on innovation performance. Finally, I describe the methodology and results, and end with a discussion of the implications of the findings.

THEORY AND HYPOTHESES

In this section, I develop theory and hypotheses about the optimal network strategy for innovation performance. I take a contingency perspective and argue that the most optimal network strategy depends on the heterogeneity of the context. Consistent with previous work, I distinguish between the inside (internal) and the outside (external) of the firm (see Geletkanycz and Hambrick, 1997), as the internal and external dimensions represent different types of contacts and therefore are likely to be sources of different types of information, knowledge, and work practices. I further conceive of the MNEs as operating across geographies and distinguish between local contacts that operate in the same geography and global contacts that operate outside the local context (Nohria and Ghoshal, 1997).

Networks in a global management consultancy and the effects on innovation performance

In the context of the management consulting firm I studied, the firm and country boundaries were also the most prevailing way of classifying the informal relations that the senior partners maintained. Prior to collecting survey data, we interviewed 32

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senior partners across five Western European countries. When describing their informal relations, the partners clearly separated their connections to colleagues (internal) and the connections they had with clients or other important contacts outside the firm (external). In the words of one partner: *'I think we need to look at the two variables, the balance and focus of attention on external networks and internal networks.'* Another partner talked about the importance of the internal network to access information or knowledge: *'I have built the network of people; of relationships in the firm. . .it can help internal instances like sharing information, knowing where to find something.'* He also spoke of the importance of the external network: *'I've talked quite a lot about the external networks; there are obviously client networks.'* Moreover, because these partners operate in a global context, they have both local and global contacts, for example one partner said that '*. . .we extend our contacts across borders.'* Another expressed the need to share knowledge across geography: *'You must be glocal, which means that you must be local and global. And I think you must be global to share expertise. . .*' Figure 1 summarizes the four different types of informal relations these partners maintained: internal-local, internal-global, external-local, and external-global ties.

Innovation performance

As outlined in the introduction; innovation is important for the continued growth and sustainable competitive advantage of MNEs (Doz *et al*., 2001). In fact, innovation performance has been shown to drive performance and firm survival in a range of industries (e.g., Banbury and Mitchell, 1995; Brown and Eisenhardt, 1997; Christensen, 1997). In the context of professional services, knowledge creation is also vital to sustainable competitive advantage (Sarvary, 1999). In the global management consulting firm we studied, the senior partners are expected to contribute to the firm with new knowledge. As one of the London-based partners expressed: '*. . .there's almost a behavioral shift to try to get partners to think about people and our knowledge as the most important asset we have, as opposed to something that is directly revenue generating.'* During the same interview this partner said: '*. . .every year one needs to do some specific research or develop some thought capital. . .if ultimately you look at consulting it is basically about people and knowledge, part of the responsibility is. . .to develop knowledge.'* The partners also discussed how they were able to draw on their informal networks to help them create new knowledge. One partner said: *'We are good at contributing to the knowledge base. Knowledge spreads through talk in the corridors and in the bars.'* Moreover the partners seemed to be quite aware of the importance of these relationships for their ability to access information and resources: *'To get resources it is important to know managers and partners internally.'*

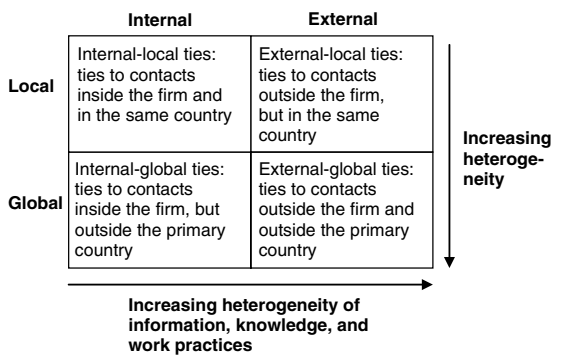

Figure 1. The four different types of ties in a multinational manager's network

The type of knowledge that the partners were expected to contribute included information about new industry practices, new products, or new ways of implementing existing processes. Some of the partners relied mostly on leveraging existing knowledge and practices in the firm when going about their work, whereas others were continuously looking for new ways of doing things and contributed more to the firm in terms of developing new knowledge and practices. The partners were also judged as being innovative if their clients and other industry players valued them as someone they could look to for new ideas, ways of thinking, or with inspirations about what might be happening in their industry. The methods section describes in more detail how the partners were measured on innovation performance.

Connections between internal contacts

The internal network is one source of potential exposure to new and novel information and knowledge. Previous research has shown that crossing organization and geographic boundaries is likely to allow for exposure to diverse sources

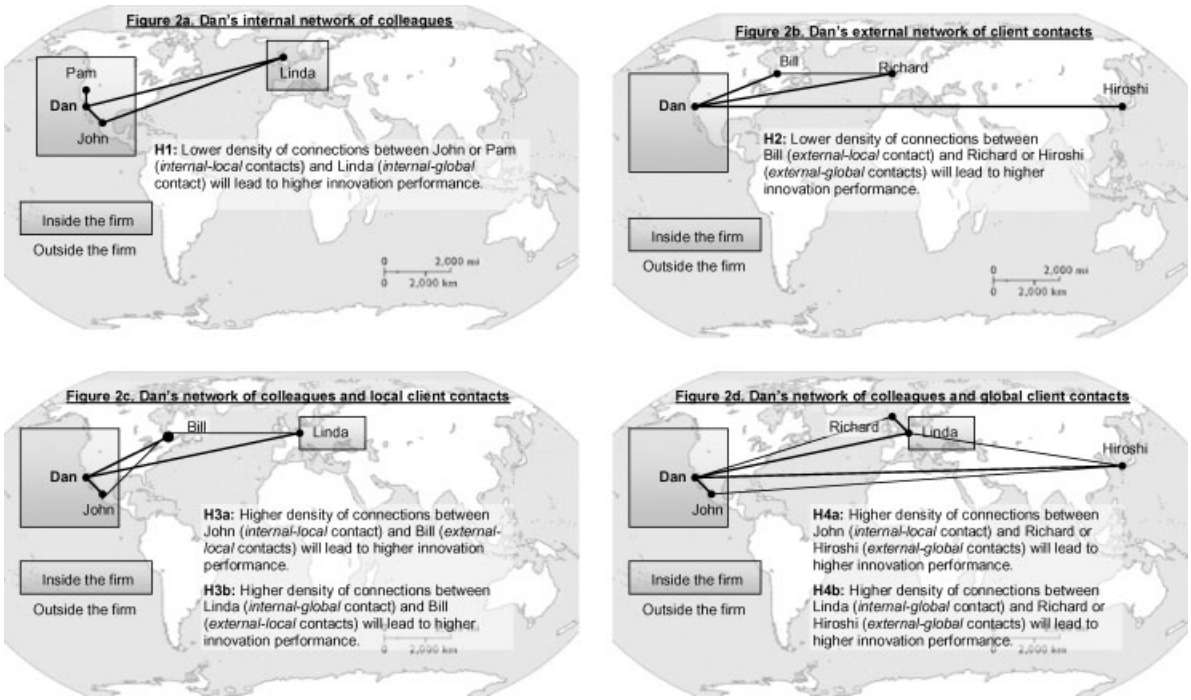

Figure 2. Connections across boundaries in the multinational manager's network and the effect on innovation performance

of information and knowledge (Ancona and Caldwell, 1992; Cummings, 2004). This exposure may come from interactions with geographically dispersed contacts in the manager's informal network (McEvily and Zaheer, 1999; Nohria and Ghoshal, 1997). Specifically, in the context of a global consulting firm. the partners interact with colleagues and clients based in many different national settings. As a consequence, they will be exposed to information, knowledge, and work practices different from those that they encounter in the immediate local environment. Through interaction with contacts outside the local environment, the partner may, for example, get information about a new technology that could be used to help an existing client in the local office. Similarly, the partner may become exposed to different work practices that dictate the way in which clients are handled in other countries. One partner explained: '*. . .one of my clients called me because he was really in trouble. He had to implement a new system. . .and we have been able to mobilize a creative team of people with knowledge of the solutions. . .people from Denver, London, Paris. . .so, knowledge sharing at the international level. . .that's really a key competitive advantage.*'

Thus, a partner has internal contacts both within and outside of the local environment. Imagine, for example, a partner working in the San Francisco office of such a global management consultancy. This partner—let's call him Dan—likely has ties to colleagues in the San Francisco office—that is, *internal-local* ties—but may also have ties to colleagues in other offices; *internal-global* ties. Figure 2a illustrates the internal part of Dan's network.

Dan has, for instance, had an ongoing project with a client in London and is working with colleagues in the London office to deliver on this project. The contacts in London operate in a different context than the one that Dan encounters in San Francisco on a number of dimensions. They operate in a different culture and rely—at least to some extent—on a different language, as well as different norms and values for conducting business. Moreover, the formal legal requirements, industry requirements, and standard operating procedures are likely to be very different. This means that the partner will be exposed to information and knowledge through his internal-global contacts that is different from what he encounters through his contacts in the local office.

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Social network scholars have established that the diversity of information flows within groups is likely to be lower than the diversity of flows between groups (Gould and Fernandez, 1989; Reagans and Zuckerman, 2001). The argument is that once actors are members of the same group; they will become exposed to the same ideas and knowledge as they communicate and share information. Thus, in terms of new ideas or knowledge, actors benefit from having open networks that connect into different information flows or knowledge domains (Burt, 1992; 2004). The network structure is therefore assumed to facilitate access to diverse information. Rodan and Galunic (2004), in their study of knowledge flows in the networks of managers in a Scandinavian telecommunications company, showed that diverse knowledge is in fact *more* likely to arise in open networks, yet such networks are not perfect surrogates for the heterogeneity of the knowledge. Here, I argue that the heterogeneity of the *context* in which the contacts operate is likely to facilitate access to diverse information and knowledge. In the example of Dan, if he has local as well as global connections, it is likely that these link to different pools of information and knowledge and thus lead to increasing Dan's access to heterogeneous information and knowledge. Once this diverse information has been accessed, it then needs to be integrated in order to create new knowledge.

Integrating information and work practices across an organization is challenging; particularly when trying to do so across different functional areas (Bechky, 2003). Yet, previous research has also shown that the flows of information and knowledge within (as opposed to between) firms is easier, as organization members benefit from the same organizational culture and standard operating procedures (Argote and Ingram, 2000; Dougherty, 1992). A shared language of communication is also likely to develop within the organization (Boisot, 1995). These commonalities facilitate communication and general flows of information. As described by one of the London-based partners: *'It is always easier to build relationships with people. . .where you have a common value set. [At the firm] we have such a common value set. . .that actually helps tremendously as you move around the world to at least give you a base point.'* Another partner talked about the ease of sharing knowledge with colleagues internally: '*. . .they know our systems, they know our networks, and they know how to get things done.'* One of the ways in which this common knowledge base is created is through the diffusion of common values across the firm (Strang and Meyer, 1993). In global firms this can be done, for example, by geographically moving managers or putting them together in common training sessions (Edström and Galbraith, 1977; Nohria and Ghoshal, 1997). One partner we spoke to described such efforts: '*. . .where you mix nationalities. . .you build this strange sort of informal individual network. . .with the people you meet in those training sessions. . .and you also build a common language, with common methodologies, common tools, common approaches in the sense of the common quality of service you can offer to the client everywhere in the world.'*

A direct implication of these arguments is that Dan may benefit from heterogeneity of information and knowledge through his internal contacts by operating across geographies. However, these internal contacts cannot be connected as they then circulate the same information and Dan no longer gains the benefits of access to heterogeneous knowledge and work practices. The internal language, culture, and standard operating procedures will facilitate the integration of this heterogeneous information, and, thus, the ability to create new knowledge. I therefore hypothesize that,

> *Hypothesis 1: The lower the density of connections between the internal-local contacts and the internal-global contacts in a partner's network, the higher the innovation performance of that partner.*

Connections between external contacts

Outside the firm, the MNE manager will be connected to clients in both the local environment (*external-local* contacts) and outside the local environment (*external-global* contacts). As with the internal ties, the implication of having external ties across geography is that the partners will be exposed to diverse information, knowledge, and work practices (McEvily and Zaheer, 1999; Nohria and Ghoshal, 1997). In the example of Dan, and as illustrated by Figure 2b, he has a few clients that he is working with out of the local office in San Francisco, but he also has global clients that are based, for example, in London and/or Tokyo. As one partner based in Madrid expressed:

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'*. . .you are playing on a global stage. . .the relationships that we maintain with [clients] on a global scale. . .are much more pervasive and far reaching than they've ever been in the past.'* A partner in Milan described the global reach of one of his colleagues: *'Marco operates almost exclusively on a cross-border basis. He's in [Italian client] one day, in [US client] the next. . .in [German client] the next day. . . 10 years ago Marco's relationships were 99 percent Italian.'* As with the internal network, this global reach of contacts will lead to an increase in the heterogeneity of the information, knowledge, and work practices to which the partner has access, and consequently have a positive effect on his ability to generate new knowledge. One London-based partner described his exposure to different practices through clients in other parts of the world: *'I'm extremely interested in people and their perspectives, their values, and I relish the differences. . .starting to appreciate and understand some of the differences of why people do things differently from how I might have expected. . . [For example] Malaysia is so multicultural: You've got Malays, Indians, Chinese . . . they've got Muslims, Hindus, just about every Chinese religion or mythology. . .the differences were very significant to this part of the world. . .And I find it absolutely fascinating, everything about it, just getting one more insight into: "That's interesting why somebody does that."'*

Moreover, if the contacts in the external network are not connected, it is more likely that they, in fact, connect into different knowledge domains. And when they are not connected, they are neither sharing nor discussing the information and experiences and will therefore likely circulate different information, knowledge, and work practices. This in turn will lead to an increase in exposure to heterogeneous information for the partner (Burt, 1992) and result in improved innovation performance (Reagans and Zuckerman, 2001). In sum, a partner will benefit in terms of innovation performance from few connections between the external-local and external-global contacts in the network. Therefore, I posit that

> *Hypothesis 2: The lower the density of connections between the external-local contacts and the external-global contacts in a partner's network, the higher the innovation performance of that partner.*

In contrast to the internal contacts, however, it is unlikely that a partner will be able to rely on the client contacts in the network to facilitate integration of the diverse information to which he is exposed. One of the reasons for this is that the partner is working to serve the client and as such, while he may become exposed to heterogeneous information through his client contacts, this does not necessarily translate into relying on those contacts to integrate this information. In fact, the clients will be looking to the partner for advice rather than assisting him. In the words of one partner: *'The worst thing to do is to just contact the [client] when you need something.'* Another partner talked about a good business relationship as being '*a pure almost customer service provider type of relationship.'* And, another said: *'when you do a good job [for the client], you resolve problems: you bring value. . .*' A second reason that a partner will be unable to rely on his external network for help in integrating diverse information is that much of the information that the partner is exposed to is private or confidential and therefore the partner cannot share it with other clients. This is potentially particularly true with new or novel information, which is likely to be sensitive or confidential. One of the partners talked of the importance of carefully managing information: *'A banker will tell you things about his bank he never will tell another banker. . .you need to manage [the information] as if it was private. Because you know you are in the middle.'* Finally, the client and partner are based in different organizations and hence cannot rely on the same organizational culture or a common language of sharing to facilitate integration of knowledge in the same way as would have been possible had they been working within the same organization. Instead, the partner may be able to rely on his internal network to interpret and integrate the diverse information accessed externally. I will discuss this point in more detail in the next section.

Connections between internal and external contacts

Thus far, I have considered the internal and external networks of the partners separately. Yet there is likely to be some degree of interaction across the two different networks. While both the internal and external networks may independently allow for access to diverse information, there may also be

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benefits from having connections across the internal and external networks. I will start by discussing the effect on innovation performance of crossing the firm boundary in the local context.

Connections between internal and external-local contacts

As illustrated by Figure 2c, Dan has, for example, some internal contacts (locally and globally) and these contacts are likely also connected to some of his external contacts in the local environment; in this case a local client; let's call him Bill. The working practices, knowledge, and information that flow in the client's firm are likely to be quite different to those in Dan's firm. As a consequence, as Dan is crossing the organizational boundary he is exposed to different information, knowledge, and work practices (Tushman and Scanlan, 1981). The challenge that Dan then faces is how to interpret and integrate the diverse information and knowledge to which he is exposed.

Managers will likely be able to integrate information and knowledge of low to moderate diversity through their direct ties alone (Sorenson, Rivkin, and Fleming, 2006). However, as the heterogeneity of information increases, for example, when crossing firm boundaries, they may likely benefit from having indirect connections in their network, that is, ties *between* the contacts in the network, which in turn will help them interpret and integrate the diverse information and knowledge. For example, if a partner, has colleagues who are connected to the same client contact, those colleagues may help each other interpret and integrate the information, knowledge, and work practices that they are exposed to through that contact. In the example above, Dan is working in San Francisco with the local client, Bill, but his colleagues John—who is also based in San Francisco—and Linda—who is based in London—also work with this client. They can therefore easily share their experiences and help each other interpret and integrate the diverse information and knowledge to which they are exposed. Some of the partners we interviewed spoke explicitly about the benefits that came from working with colleagues in both the local and global context. One Italian partner explained: *'An American partner couldn't go into [Italian client]...He would have to team up with [an Italian partner] to somehow work for [Italian client]. But neither of them could do it by themselves. [The Italian partner] might have the personal relationships, but the [American partner] would have the professional expertise to make it happen.'*

There are several ways in which dense networks of connections as described above may facilitate the interpretation and integration of diverse information and knowledge and, in turn, affect the individual's ability to create new knowledge (Nahapiet and Ghoshal, 1998; Obstfeld, 2005). As managers interact with their contacts over time, they will likely develop strong informal relationships. Previous research has shown that strong network ties facilitate the transfer of complex or codependent knowledge (Hansen, 1999; Uzzi, 1997), which is more difficult to interpret and integrate, by allowing for richer interactions (Nahapiet and Ghoshal, 1998; Sorenson *et al*., 2006).

Interactions in close-knit groups have also been shown to facilitate the learning and sharing of knowledge (Brown and Duguid, 1991; Kogut and Zander, 1992). One of the reasons for this is that such groups are able to develop a shared language of communication (Boisot, 1995). This common language, in turn, is likely to facilitate their ability to interpret and integrate diverse information and knowledge (Dougherty, 1992). Over time, as information becomes more redundant in these dense interactions, it will lead to a common knowledge base (Tortoriello and Krackhardt, 2010). And once such a common knowledge base exists, it will be easier for two parties to share knowledge. In the context of the management consultancy, the partners described how operating across the firm boundary led to interactions between colleagues internally and clients externally, which in turn allowed them to share and develop knowledge. For example one partner said: *'The way I'm conducting my business...that's clearly based on knowledge...It might be knowledge of [the clients] business...knowledge of their contacts...knowledge of their environment... knowledge of their projects...it's all related to knowledge-exchange, group-work, collaborative work, the way we manage our knowledge, and the way we roll out and share this knowledge.'*

Obstfeld (2005) in his study of innovation in an automobile manufacturer showed that a *tertius iungens* orientation of bringing people together in the network had a positive effect on innovation. The argument is that individuals who actively introduce dissimilar others are more likely to be

involved in the activities of combining novel ideas and information, which in turn lead to innovation. Similarly, the partners in this context may be able to bring together the internal and external contacts in their network, which might reflect their tendency for innovation or lead to an environment that facilitates the creation of knowledge (Brown and Duguid, 1991). As one partner said: *'I absolutely believe in the value of diversity [of information] and that different perspectives coming together lead to a better answer. . .probably the more innovation creativity and ideas you have.'* In sum; I expect that the partners' innovation performance will positively benefit from dense interactions between the internal- and external-local network ties. In formal terms:

> *Hypothesis 3a: The higher the density of connections between the internal-local contacts and the external-local contacts in a partner's network, the higher the innovation performance of that partner.*
>
> *Hypothesis 3b: The higher the density of connections between the internal-global contacts and the external-local contacts in a partner's network, the higher the innovation performance of that partner.*

Connections between internal and external-global contacts

The partners not only have external contacts in the local environment, but also outside the local context. In the words of one of the French partners: *'As far as globalization is concerned, my experience is that you start by developing. . .[a] global network of relationships.'* Several partners discussed the importance of sharing knowledge across geographies. One partner, for example, viewed the process of globalization as allowing for cross-border flows of information: *'Globalization is not about setting up an organization which covers the globe. That's the easiest part. Globalization is to establish an. . .informal network which cuts across the globe, and is used for communication in as many matters as possible. . .as long as these channels are not bound to a particular piece of geography.'* Operating in such a global firm, of course, means that the partners have clients in different geographies. These external-global contacts are likely to give the partners access to information, work practices, and knowledge significantly different from that which they are exposed to in the local context. Consequently, they will face significant challenges interpreting and integrating this diverse information, knowledge, and work practices. These global contacts are not only located outside the firm but also outside the local context, which leads to interpretation across geographies. Some of the partners talked about the difficulties this entailed: *'There were country barriers that prevented a good sharing of. . .resources, and to build and share. . .knowledge.'* And: '*. . .the language is a huge barrier to really building relationships and understanding people.'* Some also explained how operating in different cultural contexts led to interpretation difficulties with clients: *'I was on a conference call earlier this afternoon with an American, Italian, Spanish. . .you're constantly worried that you're talking past each other because they have a different set of contexts as to what the problem is that we are trying to solve.'*

In the same way as with the clients in the local environment, the partners may rely on their internal contacts to help them interpret and integrate the diverse information and knowledge that comes from interacting with global clients. This could happen through a *tertius iungens* strategy where the partners introduce contacts in their network and thus facilitate knowledge sharing and creation (see Obstfeld, 2005). In fact, one partner talked about bringing global clients together with people in the firm: '*[W]e were creating the network. . .talking with people, bringing people to seminars in Belize, or in Paris. . .creating the network with the help of our internal network.'*

As discussed above, inside the firm the partner can rely on the standard procedures in place for sharing knowledge, as well as the common language that often exists among employees of the same firm to help each other interpret and integrate diverse information (Bechky, 2003; Dougherty, 1992). People are also more similar within than between organizations, which makes it easier to transfer knowledge within firms (Argote and Ingram, 2000). Connections between the internal- and external-global contacts in the network may also lead to redundancy of information (Nahapiet and Ghoshal, 1998), which over time may facilitate integration of diverse information. Thus, if a partner has colleagues who are connected to the same external-global contacts, those colleagues may help the partner interpret and integrate

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diverse information. For example, as illustrated by Figure 2d: if the partner Dan in San Francisco has colleagues locally who are connected to the same client in Tokyo, they can easily share experiences and help each other interpret and integrate the diverse information and knowledge that might result from interacting with that client. Similarly, the partner may rely on a colleague in the Tokyo office to help interpret and integrate the information and practices he is exposed to through the Tokyo client. I therefore expect that:

Hypothesis 4a: The higher the density of connections between the internal-local contacts and the external-global contacts in a partner's network, the higher the innovation performance of that partner.

Hypothesis 4b: The higher the density of connections between the internal-global contacts and the external-global contacts in a partner's network, the higher the innovation performance of that partner.

SENIOR PARTNERS IN A GLOBAL MANAGEMENT CONSULTING FIRM

This research focuses on the informal networks of senior partners in a global management consulting firm (hereafter referred to as 'the firm'). When this study was conducted, the firm was one of the largest and most diversified professional services firms worldwide. The firm employed more than 55,000 professionals and operated in more than 100 countries to deliver a wide range of management consulting services. The firm had annual sales of more than US$500 million, and had been profitable for several years. Like most large management consultancies, the firm had a partnership structure and was owned and managed by a group of 1,100 semiautonomous senior partners. To be able to serve its global clientele, the firm was organized into five global industry groups: financial services, communications and high technology, products, resources, and government. This organization structure allowed for effective leverage of knowledge and resources across borders and also facilitated industry-specific learning.

The partners had two main responsibilities. Internally, they were responsible for managing and implementing existing client engagements. This involved mobilizing professional staff to work on the different projects, developing and retaining individuals already engaged on client projects, as well as evaluating and obtaining knowledge and expertise available in the firm. Externally the partners were responsible for identifying and negotiating access to attractive new business opportunities. In this capacity the partners also attracted and hired new consultants, as well as obtained new knowledge and expertise from external sources, such as the larger business and academic community. In managing both of these responsibilities, the partners also managed the interface between the internal operations of the firm and the external environment. Because this firm operates on a global basis, the partners were also expected to reach out beyond the local community to access new opportunities, interact with colleagues, or tap into relevant and leading-edge knowledge and expertise.

There are several reasons why this is an appropriate context for this study. First, processes of knowledge creation are particularly important in management consulting firms as these firms to a great extent sell the knowledge and expertise of the firm (Sarvary, 1999). Second, the informal relationships that the partners have play an important role in the functioning of management consulting firms (Nohria and Eccles, 1992), which means that these relationships are likely to have a measurable effect on the performance of the individual partner. Third, this study focuses on the senior partners in the firm. At this level, the partners are expected to contribute significantly to the creation of new knowledge and expertise in the firm. Moreover, these partners have large and diverse contact networks, which provide a good basis for understanding how they rely on their networks to create new knowledge. Finally, focusing on one firm allows me to control for factors other than the informal relations that may affect the partners' performance. In addition, I performed a number of robustness checks to ensure that the collected sample was representative of this firm.[1] Collecting data from a single firm is a common approach in network studies (e.g., Hansen, 1999; see Marsden [1990] for a discussion), and while this firm is similar to most global professional services firms in the way it operates and is organized (Maister,

[1] For details of these robustness checks see Footnotes 3 and 5 below.

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1993), I cannot make claims about the generalizability of the findings to other settings. However, studying this one firm in detail permits a much more nuanced understanding of the partners studied, as well as the characteristics of their informal relations. Specifically; studying these partners' networks in detail has allowed me to be more precise about the network structures that are most helpful for the partners' innovation performance than what has been possible in previous studies. The theoretical significance of this study is, therefore, that it provides an opportunity to view the complexity of and differences between a broader set of ties (internal, external, local, and global) across contexts that normally would be difficult to decipher.

Qualitative fieldwork

The study began with in-depth interviews of 32 senior partners from a wide variety of industries and functional specializations. The interviews were conducted in five Western European countries during the period of April to June 1998 and totaled an interviewing time of approximately 50 hours. All interviews were conducted in person, and all except one interview were taped and transcribed.[2] Each interview began with an unstructured discussion about the nature of the challenges that the partners faced and how they felt their informal relations enabled or constrained them in their work. The interview then proceeded into a semi-structured discussion of how both internal and external contacts facilitated or hindered them in the performance of their jobs and how they built and maintained their networks.

These interviews importantly informed my understanding of the firm, and while the interviews did not focus directly on innovation performance as illustrated by the quotes above, the partners still talked about the increasing importance of creating new knowledge. At the conclusion of the in-depth interviews, hypotheses related to the interaction between different structures of relations and individual partner performance were developed through an iterative process, going back-and-forth between the field data and the literature (Miles and Huberman, 1984). In order to gather more systematic data on the use of informal relations, a network survey was distributed.

[2] On the request of the interviewee one interview was not taped. Both I and the other interviewer took careful notes and these notes were typed up immediately after the interview.

Collecting survey data

The network questionnaire used was based on Burt's design (1992: see 121–125 for a detailed discussion) and uses the standard method of name generators and interpreters as developed by Marsden (1990). In order to ensure the partners stayed with contacts that were specifically related to their work, we first asked them to list on a blank sheet of paper the 10 to 20 people both inside and outside the firm and that they considered to be the most important contacts for them to be successful in their work. Once they had assembled this list, but without being bound by it, we asked them to fill in the name generator questions. These questions were specifically adjusted to fit the unique characteristics of work roles and context of the senior partners of the firm and asked, for example, for the most important sources of knowledge and expertise, as well as who they might go to for access to new business opportunities. Table 1a clearly outlines the different name generator questions. The name generator section allowed the partners to identify a maximum of 24 network contacts. On average, the partners identified 18 first-order network contacts, 13 internal, 5 external, 15 local, and 3 global.

The name generator questions in essence identify the content of each relation or the role that each contact plays in the individual partner's network (Wasserman and Faust, 1994). For example, a partner may name a contact that both assists her in identifying attractive business opportunities and also is an important source of valuable knowledge and expertise. Table 1b outlines the different types of content that resulted from the name generator questions as split by the four different network ties. I will discuss these roles in more detail in the results section.

Before conducting the final survey, it was piloted through the internal mail to six senior partners. The feedback from these pilots indicated two main problems. First, the last question on the survey asked the partners to characterize the relationships between each of the alters (i.e., contacts) in their networks. With an average of 18 ties, this required them to think about 153 alter-alter relationships (or a maximum of 276 for those who identified 24 contacts). This left concern that many partners would choose to leave parts of this question unanswered. Second, feedback to the managing partner's office made it clear that the survey required

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Table 1a. Name generator questions in the network survey*

1	Who are your most reliable sources of valuable information in terms of identifying attractive business opportunities? [2–5.10–6 names, 1.26]
2	Who are your most valuable contacts in terms of gaining new business (i.e., closing deals)? [1–4.44–6 names, 1.51]
3	Who do you consider your most important sources of valuable knowledge and expertise (e.g., industry, competency, functional)? [0–4.71–6 names, 1.54]
4	On whom do you rely to help you develop skills and knowledge in your area of expertise? [0–3.76–6 names, 1.75]
5	Who are the associate partners or managers on whom you rely to get things done? [1–4.80–6 names, 1.37]
6	On whom do you rely to sponsor and support your projects and activities? [1–4.24–6 names, 1.52]
7	Please list any other individuals who are an important part of your network and do not fit into the previous categories. [0–3.32–6 names, 2.13]

* In the survey there was space for filling in six people on the seven name generators. Each name generator had an additional question asking 'How many other personal contacts do you have in this category?' and then a box for filling in the number of additional contacts the partner had in the category. [The numbers in parentheses identify the minimum, mean, maximum names, as well as the standard deviation respectively, that each name generator produced.]

Table 1b. Roles played by the different contacts in the partners' networks§

Role	Internal-local	Internal-global	External-local	External-global	Total ties
1. Identify	222 (43.4%)	42 (8.2%)	231 (45.1%)	17 (3.3%)	512
2. Negotiate	175 (40.8%)	31 (7.2%)	201 (46.9%)	22 (5.1%)	429
3. Knowledge	329 (71.8%)	65 (14.2%)	55 (12%)	9 (2%)	458
4. Develop	271 (74.9%)	53 (14.6%)	35 (9.7%)	3 (0.8%)	362
5. Talent	402 (91.2%)	38 (8.6%)	0	1 (0.23%)	441
6. Sponsor	274 (67.2%)	71 (17.4%)	58 (14.2%)	5 (1.2%)	408
7. Other	104 (46.4%)	26 (11.6%)	87 (38.8%)	7 (3.1%)	224

§ The percentages add up to more than 100% as the same contact can be listed as a response to several questions (as listed in Table 1a)

too much time and attention from these senior partners. Based on this feedback, it was decided to conduct the survey interviews in person. Pilot tests of face-to-face interviews of six senior partners in the United States and the United Kingdom indicated that such an approach would resolve the problems. Despite spending on average of 61 minutes on each of the interviews, the partners indicated that it was a worthwhile experience.

Five trained researchers conducted the interviews in the period of November 1999 to January 2000. Because it was not possible to fly these researchers to more than 50 offices in different countries, it was decided to randomly sample partners from 10 offices in major geographical regions. The offices chosen were San Francisco, Chicago, New York, London, Paris, Frankfurt, Milan, Madrid, Tokyo, and Sydney. The actual sampling was done by a secretary, who selected every fifth partner from an alphabetical list that included all the partners linked to one of these offices. Some of these were dropped from the sample, as they were either in the process of leaving the firm, had moved to geographical regions outside of the sampled offices, or would be out of the office at the time of the interviews, leading to a final sample of 147 partners. Interviews with 133 partners were finally scheduled. Of these, 102 interviews were completed, yielding a final response rate of 69 percent. The remaining 31 interviews were not completed due to scheduling problems, illness, and other unforeseen circumstances.[3]

[3] To test if there were any systematic biases between the 147 senior partners sampled and the 102 interviewed, I tested for differences in the mean value of the main organizational units of the firm: industry group, functional practice group, and geographic location. Since the standard error of the difference

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Collecting performance data

Performance data were collected from a survey of the lead partners.[4] In the firm, each senior partner has a comprehensive annual review, where a lead partner will rate other partners within his area of responsibility on a number of measures. These include measures of financial performance, capabilities such as new knowledge and business development, innovation, management and leadership capabilities, and so on. The annual review for 1999 took place at the beginning of 2000, a few weeks after the completion of the network survey. This allowed us to collect performance and capabilities data shortly after the completion of not only the network survey but also while the annual reviews were still fresh in the minds of the lead partners. The questions used in this survey were developed with the help of the managing partners sponsoring the project and were tested on two lead partners. This test was successful and led to no major changes.

It was decided to conduct these interviews over the telephone. This ensured that surveys were completed correctly and required little time from the partners. Some problems with scheduling, cooperation, and changes in responsibilities of lead partners, or the partners who participated in the network survey, meant that it was not possible to collect performance data on 23 of the partners. Performance data on 79 of the 102 partners surveyed were collected from 21 lead partners. I tested the data for systematic differences on the main independent variables of those partners on whom performance data were collected, in comparison with those on whom these data were not obtained, and found no evidence of bias.[5]

METHOD

To test the hypotheses, I ran an ordered logit model on the dependent variable innovation performance. Ordered logit is used when polychotomous dependent variables have a natural order (Kennedy, 1998; Long, 1997) but the distance between the intervals is not perfectly interval scaled as the coding of the dependent variable represents a ranking. In this case the dependent variable, innovation performance, was measured on scales that have an increasing order in terms of innovation performance; however, while the supervising partners who ranked the partners on the performance evaluations were clearly instructed about the meaning of the different points on the scale, we cannot be entirely certain that they viewed, for example, the distance between a four and a five on the Likert scale as exactly the same as the distance between, for example, a two and a one. I therefore have chosen to report the ordered logit model, which takes into account this ordering of the dependent variable.[6]

Measures

The dependent variable, *innovation performance*, was calculated by combining two measures from the performance evaluation survey. The first measure considered the partners' contribution to the firm in terms of new knowledge, and was scored on a Likert scale from one to five, where one is: 'Meets minimum expectations for contributing to the firm's knowledge capital and assets;' to five: 'Industry recognized thought leader whose ideas and assets have impact in the marketplace

in means (t-value) of the population is not available, it needs to be estimated. The procedure for this depends on whether the difference in variance of the two samples is statistically significant. Levene's (1960) test provides a way to assess this. This test revealed that there were no significant differences with respect to industry group and functional specialization. Partners in two offices (Chicago and Sydney) were more likely to participate, but this can be explained by the fact that the interviewers had more time to set up the interviews and more time was spent in those geographical regions. Partners in the San Francisco office were less likely to participate, which can be explained by less time being spent in San Francisco for those interviews. These results hold whether one compares the 102 interviewed partners to the initial sample of 147 or to the 133 who indicated their willingness to take part in the survey. Thus I believe the sample to be representative of the larger population of partners in the firm.

[4] Ideally we would have had access to the annual review documents for the partners participating in the survey. The main sponsor was initially supportive of this, however, the legal and political issues associated with providing highly sensitive personal information on partners from many different juridical areas made the firm's leadership unwilling to go ahead.

[5] To test if there were any systematic biases between the 102 senior partners whose network data were collected and the 79 whose performance data were collected, I tested for differences in the mean value of the main independent variables. Levene's (1960) test revealed that there were no significant differences with respect to any of these measures.

[6] However, as reported in the results section; to be sure, I also have included an Appendix that reports the OLS models and shows that there are no substantial changes in the results.

(ROI)'. The second measure was closely related and looked at the partners' ability to create new knowledge and expertise and was also rated on a Likert scale from one to five, with anchors: 'Much better at leveraging existing knowledge and expertise,' and 'Much better at developing new knowledge and expertise'.

These two measures show the two ways in which the partners are expected to contribute to the firm and therefore are evaluated as such. First, the partners are expected to contribute internally with new ideas that may be helpful for other managers or partners in the marketplace, new processes for handling clients, and other ideas or knowledge that may be helpful for dealing with internal processes. Second, the partners are expected to contribute with innovative thinking, knowledge, and ideas that get them recognized in the market place with clients and other industry experts. This is an important part of their job, as it will ultimately help the firm sell more business. As the partners need to contribute both internally and externally to the firm on these dimensions of innovation, it is difficult to disentangle the two and ultimately their performance evaluation scores on innovation performance, as measured by the two questions in the survey, will capture a bit of both of these processes.

While running the models separately on the two measures produced consistent results, I have chosen to combine them to increase the robustness of the measure. Taking the average of these two measures creates the combined variable *innovation performance*. The two measures have been tested for internal reliability and have a Cronbach Alpha of 0.78.[7] Finally, to ensure that I was not just measuring those partners who performed well (overall) and actually captured differences in innovation performance, I ran the same regression models using financial performance as a dependent variable. These models came out significantly different assuring that I am capturing variance on innovation performance and not just overall performance.

The location of each tie in the individual partner's network was determined from one of the name interpreter questions in the survey. Internal ties are operationalized as those ties that partners have to other people within the firm, whereas external ties are ties to all people outside the firm. Local ties are defined as those ties that partners have to colleagues or clients in the same country as that of the primary office where the individual partner is based. Global ties are operationalized as ties outside of that country. Determining the location of each contact allows me to categorize the ties into the four different types of ties: internal-local, internal-global, external-local, and external-global. There is variance across the different partners and the types of networks they have, with some of the partners being primarily focused on connections inside the firm and others being more externally focused. Figure 3 gives some examples of the different types of ties the partners have. Examining these networks closer gives some more information about these partners. For example, partner A is locally focused with most contacts situated in the local environment. Partner B is someone who primarily focuses on processes inside the firm and she has no connections outside of the local environment. The third graph is partner C, who mainly engages with client contacts and focuses on selling and implementing business with them. Partner D has a dense network as all the contacts in her network are interconnected.

In the analyses, I controlled for the density *within* each of the four categories of ties. To measure this variable, I counted the number of ties within each group and weighted them by strength. This number was then divided by the total number of possible ties in the group, which equals $(n(n-1)/2)$ if there are n nodes in a category. This is a common way to measure density used in network theory (Wasserman and Faust, 1994; Burt, 2007). The measure of strength used is the emotional closeness between each alter tie in the individual partner's network.[8] Closeness was based

[7] To ensure that the results were not a function of variation in ratings given by the different lead partners rating the individual partners on performance, I used a clustering command in Stata to adjust the standard errors based on the 21 lead partners rating the individual partners on innovation performance. This clustering command produced no significant changes to the results, and I have therefore chosen to report the results that were non-adjusted. Moreover, I also tried running the analysis using a control variable, which was calculated as the average innovation performance rating given by the lead partners across the partners that individual rated. This variable also came out nonsignificant and did not change the results.

[8] As I did not have measures of frequency of interaction between alters, I was limited to using closeness as a measure of strength. While frequency is a commonly used measure of strength (e.g., Granovetter, 1973), closeness may be a more accurate measure as two people may interact frequently, but still not be particularly close (see Marsden and Campbell, 1984).

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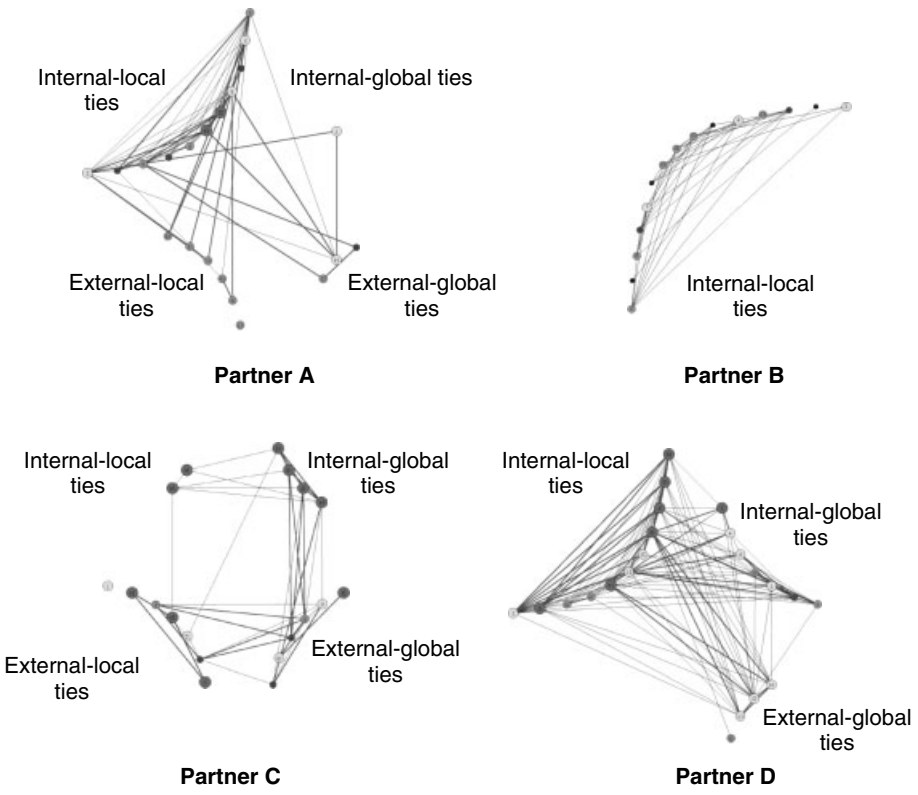

Figure 3. Examples of networks of partners in the firm*

on a question in the survey asking the partners to rate the relationships between each of the alters in their networks on a scale from 'distant' to 'especially close,' with 'neither distant nor especially close' in the middle.[9] So if there are n nodes in the internal-local network of a partner and S_i measures the strength of the tie i, ($i = 1 \ldots N$), where N is the total number of connections in the internal-local network [$N \leq (n(n-1)/2$] and $n(n-1)/2$ is the maximum of all possible ties of the highest strength, therefore $0 < \Delta_{i-l} < 1$. Then the density (internal-local) is calculated as follows:

$$\Delta_{i-l} = (\sum_{i=1}^{N} S_i)/(n(n-1)/2)$$

Similarly, to test the hypotheses, I calculated the density of connections between each of the four categories. I refer to this variable as the density *between* different types of ties. It was calculated in the same way as the density within the different categories of ties, except here the total number of possible ties between two groups of ties is the multiplication of the number of nodes in each group. There are four categories of ties, which

[9] While a more complete and potentially unbiased measure of the relationship between two alters would be to ask those two alters directly about their relationship, as opposed to asking the partners to rate the relationship between these two people, it was not practically possible for me to obtain such a measure. Specifically, it would involve verifying and cross-referencing approximately 16,600 relationships with people across numerous organizations and across many different countries. In addition, it is common practice to use egocentric measures for the relationships between alters in a network (see Burt, 1992; 2007). Finally, because the people whom the partners listed in their networks were the most important for them in their work and the relationships had lasted on average 5.5 years, it is reasonable to assume that the partners know those people well enough to estimate the relationships between them.

* The nodes (dots) represent a tie between the individual partner and a contact. The size of the node is the strength of the tie between ego (the individual partner) and alter (the contact) as measured by closeness: the bigger the node, the stronger the tie, and the smaller the node, the weaker the tie. The lines represent connections between the contacts in the partners' networks. The thick lines represent strong ties between alters, and the thin lines represent weak ties. The upper part of the graphs show the internal ties, the lower part the external ties. The left side of the graphs show local ties, whereas the right side show the global ties.

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resulted in a total of six different measures. So if there are n(i,l) nodes in the internal-local network of a partner, and n(e,g) nodes in the external-global network of the same partner, and S_i measures the strength of the tie i, ($i = 1 \ldots N$), where N is the total number of connections between those two categories of ties [$N \leq (n(n-1)/2$], then the density of connections between these two categories is:

$$\Lambda_{i,l-e,g} = \left(\sum_{i=1}^{N} S_i\right)/(n(i,l) \times n(e,g))$$

The network survey had several questions on background data, which allowed me to control for other factors that might affect the individual partner's innovation performance.[10] One might expect that younger or less experienced partners are better at creating new knowledge, as these partners might be more innovative in their thinking and less stuck in the processes of implementation or exploitation of existing knowledge. Similarly, partners with higher education might also score higher on their ability to create new knowledge. I therefore included controls for *age* and *education* in the analysis. I also included a variable measuring how long each partner worked with the firm before being promoted to partner (*time to partner* is years with the firm minus years as partner). It could be argued that the longer each partner has worked for the firm, the more familiar he becomes with the organizational routines and basic workings of the firm. This familiarity could lead to the partner being less innovative and a bias toward scoring lower on innovation performance.

The third set of control variables concerned the partners' functional specializations. First, in the firm's functional organization, partners specialize in one of four areas: strategy, change management, process, and technology. It could be argued that strategy projects are less standardized and more diverse, and generally will lead to partners being better at creating new knowledge. In turn, the process (or systems implementation) projects may have less diversity, be more standardized, and consequently lead to less innovative thinking. As a result, it may be that partners working in strategy are rated higher on their ability to create new knowledge, whereas partners working in process rate lower.

The partners in the firm also specialize in five different industries: communications and high technology, financial services, products, resources, and government. The pace of change in these industries varies (Brown and Eisenhardt, 1997), and it is therefore likely that the industry in which the individual partner works may affect her ability to create new knowledge. I therefore included a control variable for the industries in which the partners work.

Finally, as network density tends to be negatively correlated with the size of the network, I include a control for network size (Reagans, Zuckerman, and McEvily, 2004). It might be expected that partners who have large networks are likely to be more innovative. Moreover, as previous work has theorized about the overall egocentric density of actor networks, I control for the overall egocentric density of each of the partner's networks. As predicted by previous research, partners with lower densities in their overall networks would be expected to have higher innovation performance. Subsequent models in the analysis control for the densities of the different parts of partners' networks, that is, internal-local, internal-global, external-local, and external-global ties.

RESULTS

Descriptive statistics and bivariate correlations are reported in Tables 2a and 2b, respectively. The results of the ordered logit regression analyses are reported in Table 3.

Models 1 and 2 report the results of the basic controls on the dependent variable *innovation performance*. The first model shows the control variables including the network controls: total network size and egocentric density. The second model shows the results when network size and density are split into the separate components based on the

[10] Background data on the partners' age, gender, office location, and education were collected. There were only six women in the sample and I found no significance for the control variable for gender. Similarly, I found no significance for whether or not a partner is an expatriate. I decided to exclude these variables from the final analysis to preserve degrees of freedom. For the control variable for office location (where each partner works), I found significance only for the Tokyo office. The coefficient was negative, which means that partners working in Tokyo are less innovative. Perhaps the Japanese culture is such that partners are encouraged to leverage existing knowledge, rather than pursuing the creation of new knowledge. Neither the inclusion of the control variable for Tokyo in the analysis nor the exclusion of the Tokyo-based partners from the sample changed the results.

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Table 2a. Descriptive statistics (n=79)

Variables	Mean	St.d.	Min.	Max.
1. Innovation performance	3.00	0.92	1.00	5.00
2. Age	43.72	4.46	37	55
3. Education	3.72	0.55	3.00	5.00
4. Time to partner	9.61	3.58	0	15
5. Process	0.27	0.45	0	1
6. Change	0.24	0.43	0	1
7. Technology	0.27	0.45	0	1
8. Strategy	0.23	0.42	0	1
9. Communications and high technology	0.23	0.42	0	1
10. Financial services	0.30	0.46	0	1
11. Products	0.20	0.40	0	1
12. Resources	0.23	0.42	0	1
13. Government	0.04	0.19	0	1
14. Network size	18	4.09	6	24
15. Egocentric density	0.29	0.10	0.06	0.57
16. Density within internal-local ties	0.48	0.19	0.13	1.00
17. Density within internal-global ties	0.24	0.34	0	1.00
18. Density within external-local ties	0.28	0.29	0	1.00
19. Density within external-global ties	0.04	0.12	0	0.50
20. Density between internal-local and internal-global	0.18	0.19	0	0.70
21. Density between external-local and external-global	0.02	0.09	0	0.67
22. Density between internal-local and external-global	0.02	0.06	0	0.24
23. Density between internal-global and external-global	0.03	0.08	0	0.50
24. Density between internal-local and external-local	0.15	0.12	0	0.50
25. Density between internal-global and external-local	0.04	0.11	0	0.58

type of network, that is, internal-local, internal-global, external-local, and external-global. Models 3 to 6 report the results as the hypotheses are tested stepwise. Finally, Model 7 shows the reduced model with only the main independent variables. All the models report robust standard errors.

In the first model, the competency *change* is negative and significant. Although one might expect change projects to give access to diverse information and practices, these are often large-scale projects where the partners rely on standardized solutions for implementing change. Hence, there may be less room for the partners working in change to explore new information and practices, and they may be more likely to focus on implementing existing knowledge and expertise. Of the industry control variables, *financial services* has a negative and significant effect on the partners' innovation performance. This is an industry where standard operating procedures and routines are likely to be favored and there may, therefore, be little room for innovation. *Communications and high technology* and the industry *resources* also have negative and significant effects on innovation performance. Thus it seems that the partners gain little in terms of innovation performance merely from the industry in which they work. Although the effects are in the expected direction, neither *network size* nor *egocentric density* has a significant effect on innovation performance in this setting. Yet, as I will argue below, this may be because the complexity of this setting is such that it is only by separating the different types of ties that we are able to decipher the effects on innovation performance.

Model 2 introduces the size of each of the different types of ties and additional controls for the densities *within* each of the four categories of ties: internal-local, internal-global, external-local, external-global. None of these variables are significant, and to reduce the degrees of freedom I control for overall network size in subsequent models.

Models 3 to 6 introduce the terms testing the hypotheses. In all four models, the variable measuring the density within internal-global ties in a partner's network is positive and significant, indicating that partners are more innovative the higher the density of connections among their global colleagues. This finding is perhaps further

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Table 2b. Bivariate correlations (n=79)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. Innovation perform	—																							
2. Age	−0.10	—																						
3. Education	0.05	0.22*	—																					
4. Time to partner	−0.13	−0.27*	−0.29*	—																				
5. Process	0.03	0.12	−0.11	0.35*	—																			
6. Change	−0.26*	0.02	0.07	0.03	−0.34*	—																		
7. Technology	0.09	−0.16	−0.16	0.07	−0.42*	−0.31*	—																	
8. Strategy	0.13	−0.01	0.25*	−0.46*	−0.35*	−0.26*	−0.33*	—																
9. Comm & high tech	0.00	−0.07	0.22	−0.06	−0.12	−0.02	0.08	0.09	—															
10. Financial services	−0.27*	−0.08	−0.12	0.02	−0.15	0.14	−0.02	0.02	−0.33*	—														
11. Products	0.21	−0.07	0.03	−0.08	−0.02	0.09	−0.09	0.00	−0.27*	−0.32*	—													
12. Resources	0.03	0.21	−0.05	0.08	0.36*	−0.18	0.02	−0.02	−0.28*	−0.29*	−0.27*	—												
13. Government	0.14	0.12	−0.26*	0.11	0.12	0.04	−0.02	−0.15	−0.17	−0.17	−0.16	−0.14	—											
14. Network size	0.04	0.02	−0.04	−0.07	0.07	0.12	−0.09	−0.09	−0.15	0.08	−0.16	0.26*	−0.03	—										
15. Egocentric density	−0.07	−0.17	−0.10	0.14	0.11	−0.22*	0.05	0.04	0.02	0.03	0.10	−0.11	−0.07	−0.32*	—									
16. Density int-local	0.04	0.14	0.01	0.10	0.29*	−0.25*	−0.01	−0.03	0.03	−0.09	0.06	0.05	−0.07	−0.23*	0.61*	—								
17. Density int-global	0.23*	0.11	−0.03	0.01	0.13	0.04	−0.11	−0.11	−0.14	−0.13	−0.00	0.14	0.11	0.16	0.11	0.26*	—							
18. Density ext-local	−0.16	−0.06	0.01	0.18	−0.06	0.01	0.19	−0.14	0.05	0.05	−0.12	0.04	−0.07	0.14	0.32*	0.07	−0.04	—						
19. Density ext-global	0.05	0.02	−0.00	0.05	0.15	0.12	−0.20	−0.05	−0.10	−0.13	−0.04	0.23*	0.04	0.21*	−0.11	−0.03	0.28*	−0.22*	—					
20. Int-loc to int-global	0.11	0.11	0.01	0.02	0.17	−0.09	0.12	−0.22*	−0.08	−0.07	−0.01	0.07	0.09	0.23*	0.21*	0.31*	0.77*	−0.03	0.30*	—				
21. Ext-loc to ext-global	−0.01	−0.13	0.07	0.13	0.12	0.08	−0.16	−0.04	−0.14	0.04	0.01	0.07	−0.03	−0.00	0.06	0.00	0.28*	−0.06	0.33*	0.23*	—			
22. Int-loc to ext-global	0.25*	−0.09	0.01	0.15	0.18	0.11	−0.20	−0.08	−0.07	−0.18	0.04	0.12	0.06	0.10	0.01	0.06	0.36*	−0.12	0.74*	0.34*	0.58*	—		
23. Int-glob to ext-global	0.28*	−0.09	0.12	−0.14	−0.05	0.09	−0.19	0.11	0.14	−0.13	−0.04	−0.03	0.03	0.10	−0.11	−0.07	0.18	−0.08	0.44*	0.23*	0.36*	0.66*	—	
24. Int-loc to ext-local	−0.13	−0.27*	−0.01	0.14	−0.09	−0.07	0.10	−0.02	−0.03	0.04	0.05	0.02	−0.09	−0.31*	0.67*	0.25*	−0.06	0.38*	−0.12	−0.08	0.09	−0.15	0.11	—
25. Int-glob to ext-local	−0.02	−0.23*	−0.06	0.13	−0.04	−0.10	0.16	0.11	−0.19	0.12	−0.03	0.12	−0.09	0.07	0.41*	0.05	0.29*	0.30*	0.09	0.41*	0.26*	0.47*	0.17	−0.12

* $p<0.05$.

Table 3. Results from ordered logit regression analyses on innovation performance[a]

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age	−0.08	−0.11	−0.09	−0.09	−0.10	−0.04	
	(0.06)	(0.08)	(0.08)	(0.08)	(0.08)	(0.09)	
Education	0.26	0.67	0.54	0.55	0.52	0.51	
	(0.44)	(0.56)	(0.47)	(0.45)	(0.46)	(0.52)	
Time to partner	−0.07	−0.10	−0.10	−0.10	−0.10	−0.06	
	(0.09)	(0.12)	(0.10)	(0.11)	(0.11)	(0.11)	
Process	−0.29	0.41	0.45	0.43	0.34	0.47	
	(0.89)	(1.14)	(0.91)	(0.96)	(1.06)	(1.02)	
Change	−1.92†	−1.48	−1.48	−1.49	−1.40	−1.38	
	(1.05)	(1.13)	(1.03)	(1.05)	(1.12)	(1.09)	
Technology	−0.13	0.52	0.94	0.91	0.85	1.49†	1.31*
	(0.77)	(0.97)	(0.85)	(0.93)	(0.96)	(0.92)	(0.59)
Communications and high technology	−2.49†	0.33	−1.63	−1.65	−1.58	0.26	
	(1.28)	(0.83)	(1.28)	(1.34)	(1.33)	(1.79)	
Financial services	−3.06**	−0.35	−2.17†	−2.17†	−2.08	0.34	
	(1.23)	(0.62)	(1.19)	(1.20)	(1.28)	(1.79)	
Products	−1.29	1.40†	−0.48	−0.49	−0.37	1.87	
	(1.36)	(0.83)	(1.41)	(1.44)	(1.49)	(1.89)	
Resources	−2.64*		−2.17†	−2.19†	−1.99	0.06	
	(1.32)		(1.31)	(1.36)	(1.42)	(1.88)	
Government		2.07					
		(1.92)					
Network size	0.03		0.08	0.08	0.06	0.10	
	(0.07)		(0.07)	(0.06)	(0.07)	(0.08)	
Size internal-local		0.13					
		(0.10)					
Size internal-global		0.20					
		(0.17)					
Size external-local		0.02					
		(0.11)					
Size external-global		0.41					
		(0.49)					
Egocentric density	−3.37						
	(2.51)						
Density internal-local		0.16	0.01	0.01	0.50	−0.62	
		(1.25)	(1.31)	(1.31)	(1.50)	(1.43)	
Density internal-global		1.27	3.22*	3.23*	3.21*	4.36***	3.38**
		(1.40)	(1.40)	(1.36)	(1.37)	(1.27)	(1.12)
Density external-local		−1.19	−1.09	−1.09	−0.94	−1.85†	−1.88†
		(1.18)	(0.94)	(0.94)	(1.05)	(1.15)	(1.13)
Density external-global		−3.54	1.26	1.28	1.22*	−8.63*	−8.72**
		(4.39)	(2.38)	(2.19)	(2.11)	(3.96)	(2.95)
H1: Density internal-local to internal-global			−4.60*	−4.56*	−4.92*	−6.52**	−4.37*
			(2.26)	(2.32)	(2.35)	(2.31)	(2.12)
H2: Density external-local to external-global				−0.78	−0.96	−9.81**	−8.91***
				(6.70)	(6.16)	(3.96)	(2.59)
H3a: Density internal-local to external-local					−2.64	0.93	
					(3.39)	(3.68)	
H3b: Density internal-glob to external-local					1.67	0.11	
					(3.31)	(3.36)	
H4a: Density internal-local to external-global						25.41**	24.57**
						(10.33)	(9.46)
H4b: Density internal-global to external-global						14.05**	12.44***
						(5.16)	(3.32)

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Table 3. (*Continued*)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Fit[b]	27.05**	31.21*	33.09**	34.75**	37.67**	66.35***	34.88***
Pseudo R-squared	0.11	0.15	0.14	0.14	0.15	0.24	0.17

[a] Ordered logit regressions (cut-points omitted). Dependent variable: innovation performance. N=79. Robust standard errors in parentheses. †p < 0.10, * p<0.05, ** p<0.01, *** p<0.001 (two-tailed test for variable coefficients).
[b] Chi-square test.

evidence that it is difficult to interpret and integrate information and practices outside of the local environment, and this problem may be overcome if there are exchanges between the global colleagues in the partner's network. It is through these exchanges that the colleagues in the partner's network interpret and integrate the diversity, which in turn positively affects the partner's ability to develop new knowledge. The change in log likelihood of the variable for the density of internal-global ties is 7.05 (significant at the 1%-level) in Model 3, 7.08 (significant at the 1%-level) in Model 4, and 11.75 (significant at the 0.1%-level) in Model 5.

The variable measuring the density between internal-local and internal-global ties is negative and significant in all four models, providing support for Hypothesis 1, which predicted that lower density of connections between the partners' colleagues in the local environment and those outside the local environment would lead to higher innovation performance. The change in log likelihood of adding the term for the density between internal-local and internal-global ties is significant in all three models: 4.36 (significant at the 5%-level) in Model 3, 4.27 (significant at the 5%-level) in Model 4, and 7.34 (significant at the 1%-level) in Model 5.

Although the sign of the coefficient is in the expected direction, the density of connections between the external-local and external-global contacts is not significant in Model 4. Nevertheless, the term is significant in the fully specified Model 6 as well as the reduced model 7. Moreover, the change in log likelihood of adding the term is significant in Model 6 (5.50 significant at the 5%-level), which suggests that the term does have a significant effect on innovation performance. I therefore consider Hypothesis 2 supported. That is, those partners who have few connections between their local and global clients are likely to be more innovative presumably because they connect into significantly different environments and thus access more diverse information and work practices, which, in turn, affects their innovative capability.

Model 5 includes the measures that test the set of hypotheses concerning the density of connections between the internal contacts and the partners' external-local contacts. These terms have no effect on innovation performance and Hypothesis 3 is therefore not supported. Model 6 reports the fully specified model and tests Hypothesis 4. Both terms are positive and significant providing support for Hypotheses 4a and 4b. The change in log likelihood of adding these terms are 6.13 (significant at the 5%-level) and 5.19 (significant at the 5%-level) respectively for the density of connections between internal-local and external-global ties and the density of connections between internal-global and external-global ties. Given that Hypothesis 3 was not supported, it seems that it is only when crossing *both* the geographic and firm boundary that the partners benefit from more density in their networks.

The variable measuring the density of external-global ties is negative and significant in Model 6. Adding the term causes a change in log likelihood of 5.91 (significant at the 5%-level). It makes sense that this term has a negative effect, as partners who have few connections between their global client contacts are likely connecting into very different areas of information and work practices. Thus, if there are no connections between the partner's global client contacts, it is more likely that the partner is connected to different global contacts and, thus, accessing information and work practices in different environments. This, in turn, will lead the partners to being better at developing new knowledge and expertise rather than having to rely on existing knowledge and expertise. Similarly, the term for the density between a partner's external-local ties is negative and significant in this model. Adding this term in Model 6 causes a significant

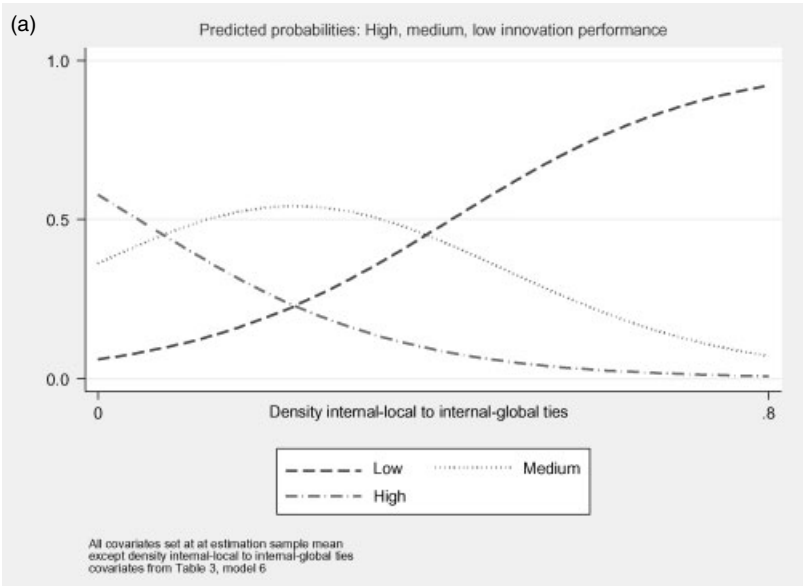

Figure 4a. Graphic representation of result testing hypothesis 1[1]

increase in log likelihood (3.39, significant at the 10%-level).

In order to get a better understanding of the results, I graph the results from Table 3. These graphs are presented in Figures 4a, 4b, and 4c.

Figure 4a shows the results testing Hypothesis 1 and reports the graph computed using the results from Model 6 in Table 3 with innovation performance on the y-axis and the density between internal-local and internal-global ties on the x-axis. The ordered logit model requires that the probability of each possible outcome on the dependent variable is shown. For simplicity, I collapse the graphs and show only three outcomes: the probability of a high (4 and 5 on the Likert scale), medium (3 on the Likert scale), and low (1 and 2 on the Likert scale) score on innovation performance. The graphs were computed using the oprobpr post-estimation command in Stata 10. In the first figure, all variables in the regression model are evaluated at their means, except for the density between internal-local and internal-global ties. The graphs reveal that as the density of internal-local to internal-global ties increases from zero to 0.8 the probability of a low score on innovation performance increases from six percent to 92 percent and the probability of a high score decreases from 58 percent to around one percent. This is in line with Hypothesis 1; that partners who have a lower (higher) density between their internal-local and internal-global ties score higher (lower) on innovation performance.

The next Figure, 4b, reports the test of Hypothesis 2, the relationship between external-local ties and external-global ties. These graphs reveal that, as expected, when the density of external-local to external-global ties increases; the probability of a low score on innovation performance increases. For example, as the density increases from zero to 0.7, the probability of a low score on innovation performance increases from 14 percent to 99 percent and the probability of a high score decreases from 35 percent to close to zero.

Finally, Figure 4c reports the graphs resulting from variations in the density between internal ties and external-global ties in the partners' networks. These graphs clearly show that, as predicted by Hypotheses 4a and 4b, the higher the density between internal and external-global ties, the higher the innovation performance. The

[1] The graph was computed with the oprobpr post-estimation command in Stata using the results in Model 6 of Table 3, evaluating the variables in the regression at their means; except the key independent variable; density internal-local to internal-global (as labeled at the bottom of the figure). The key independent variable was varied between a density of zero up to a density of around 0.8 (the maximum in this data). On the y-axis is the probability of a high, medium or low score on innovation performance as the density is varied. In effect, the formula used for the ordered logit is: Probability(Score on Innovation Performance) = Exp(cutpoint- ß×X)/(1+Exp(cutpoint−ß×X)), where ß=coefficients from regression and X=means of independent variables.

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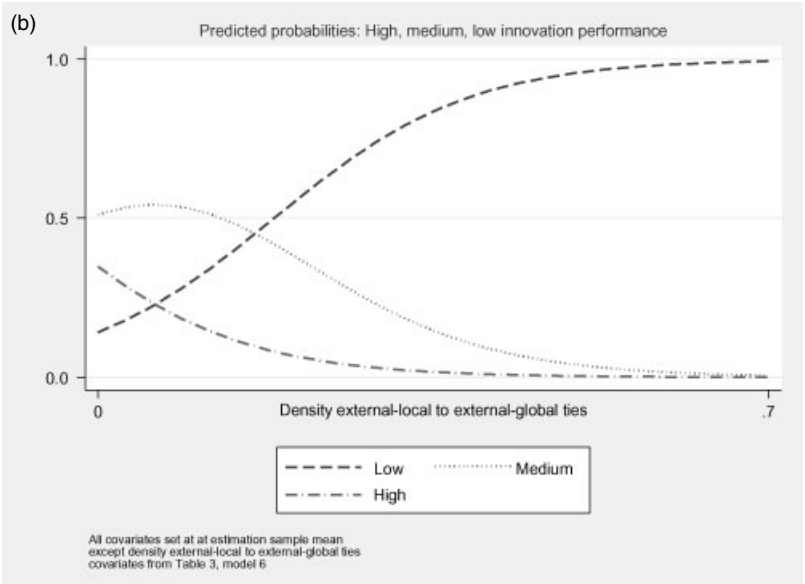

Figure 4b. Graphic representation of result testing hypothesis 2[2]

graphs in the upper figure show that as the density between internal-local and external-global ties increases, the probability of a high score on innovation performance increases from 18 percent to close to 100 percent, and the probability of a low score decreases from 28 percent to zero. The bottom figure shows the relationship between internal-global ties and external-global ties. Here we see again that as the density of internal-global to external-global ties increases, the probability of a low score on innovation performance decreases and the probability of a high score increases.

Robustness checks

In order to ensure the results are not simply an artifact of those partners who have external-global ties in their networks, I ran Model 6 and included a dummy variable for those partners who had external-global ties in their networks. This dummy variable came out nonsignificant and there were no changes in the results.

As outlined in the methods section, the dependent variable is an ordered outcome and the most appropriate model to report is therefore ordered logit. The ordinary least squares (OLS) regression model may generate predicted values that are outside the range of possible values for the dependent variable. To be sure, and as the OLS model is slightly easier to interpret; I have included an Appendix, which shows that running an OLS regression produced similar results. The reported results show first the initial model with only the basic control variables, and the subsequent models include the independent variables testing the hypotheses. As in Table 3, the final model reports a reduced version with only the significant variables included. This model is included to increase the degrees of freedom on the sample size. The results in the Appendix reveal only one slight variation from the results reported on the ordered logit model: in the final reduced Model 7, the density between internal-local and internal-global ties is negative as expected (and as reported in the main results in Table 3), but the result is no longer significant. Yet I interpret this result with caution as the reduced model lacks the relevant control variables and because the OLS model is less appropriate given the ordinal characteristics of the dependent variable.

[2] The graph was computed with the oprobpr post-estimation command in Stata using the results in Model 6 of Table 3, evaluating the variables in the regression at their means; except the key independent variable; density external-local to external-global (as labeled at the bottom of the figure). The key independent variable was varied between a density of zero up to a density of around 0.7 (the maximum). On the y-axis is the probability of getting a high, medium or low score on innovation performance as the density is varied. In effect, the formula used for the ordered logit is: Probability(Score on Innovation Performance) = Exp(cutpoint−ß×X)/(1+Exp(cutpoint−ß×X)), where ß=coefficients from regression and X=means of independent variables.

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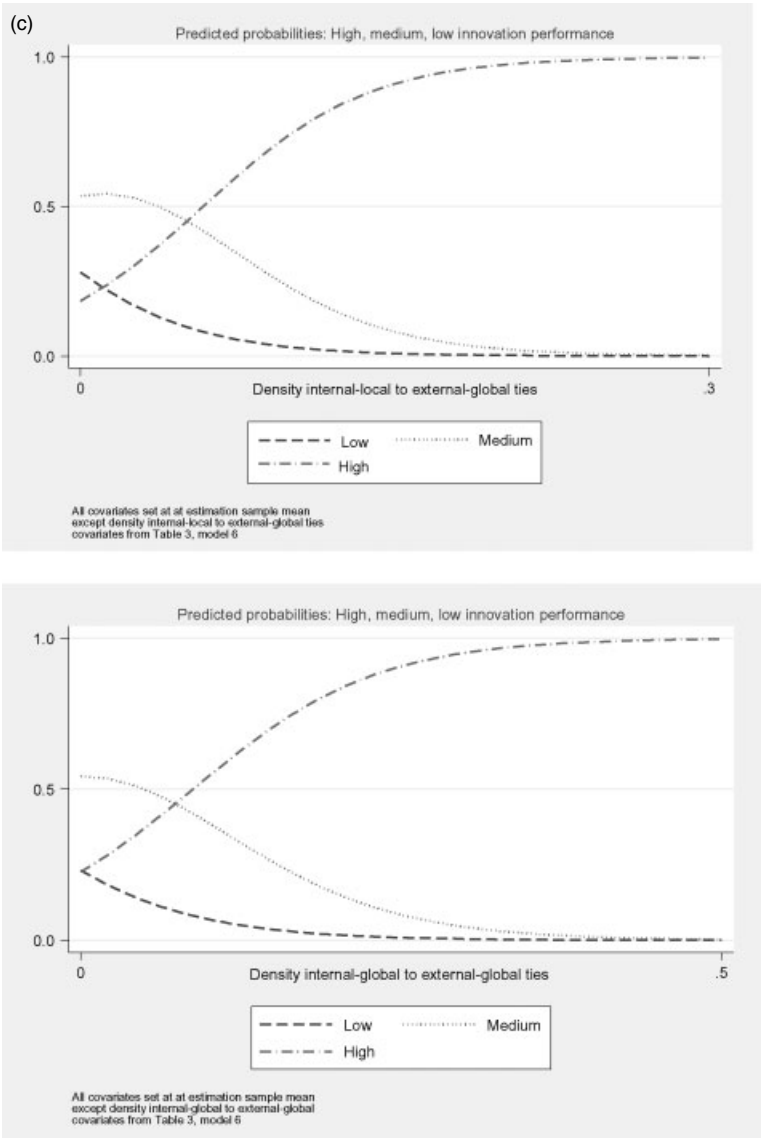

Figure 4c. Graphic representation of result testing hypotheses 4a and 4b[3]

Hypothesis 3 was not supported in the main results. It seems that it is only when the partners are crossing both the firm and geographic boundaries that they benefit from dense networks. This could potentially be caused by the fact that in the local context the partners struggle equally with accessing heterogeneous information as with integrating this information. Thus the effects cancel each other out. On the contrary, in the global context the partners are automatically exposed to diverse information and knowledge and it is only here the heterogeneity of information is such that interpretation and integration really becomes an issue. Alternatively, it could be that the partners do not rely on their external-local contacts to help

[3] The graphs were computed with the oprobpr post-estimation command in Stata using the results in Model 6 of Table 3, evaluating the variables in the regression at their means; except the key independent variables: Density internal-local to external-global ties and density internal-global to external-global. The key independent variables were varied from a density of zero up to a density of 0.5. The y-axis shows the probability of a low, medium or high score on innovation performance. In effect, the formula used for the ordered logit is: Probability(Score on Innovation Performance) = Exp(cutpoint−ß×X)/(1+Exp(cutpoint−ß ×X)), where ß=coefficients from regression and X=means of independent variables.

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them create new knowledge. In fact, when the partners were asked about how they relied on the different people in their networks, they indicated that they primarily relied on the external-local contacts to identify and negotiate access to new business opportunities (see Table 1b). That is, these ties were more likely to be sources of revenue generation than innovation. As Table 1b reports, only 12 percent of the contacts the partners relied on for access to valuable knowledge and expertise were external-local, and only 9.7 percent of the contacts used to help them develop new knowledge and expertise were external-local. On the contrary, the external-local contacts seemed primarily to fall in the category of identifying and accessing new business opportunities with 45 percent and 47 percent, respectively. While this does not mean that the partners do not use their external ties to develop new knowledge, it indicates that they primarily rely on them to generate new business. On the contrary, the partners relied primarily on their internal-local ties to access and develop new knowledge. These findings support the idea that the partners are likely to rely on their internal ties to help them interpret and integrate new knowledge. Overall, these distinctions between the different types of roles indicate that the different types of ties indeed provide different types of content in the partners' networks.

Alternative explanations

It is worthwhile to consider some alternative explanations for the findings. It could perhaps be argued that the new knowledge created existed prior to the tie and that new knowledge, in fact, leads to redundant ties rather than vice versa. For example, if one of the internal contacts in the partner's network had some new knowledge, he could use this knowledge to sell business to a new client and then introduce the partner to this client. If this were the case, then the high density between internal ties and external-global ties would be a function of the new knowledge that contact had, rather than the high density of connections in the partner's network facilitating that partner's innovation performance. However, this is unlikely to be the case in this context as all the relationships existed prior to the performance evaluation and had lasted on average 5.5 years. In addition, the performance data was collected after the network data was measured.

There are other issues of reverse causality that may play a role. For example, a partner may have sponsors in his network who, in fact, are superior at creating new knowledge and this is really what affects that partner's innovation performance, not the fact that there are connections between the contacts in the network. To be sure, I ran a logit regression in order to check if being a sponsor affects the formation of a tie. To do so, I used the different roles (or types of content accessed) that the contacts play in the partners' networks, as outlined in Table 1b. For example, I ran a binary logit regression predicting whether an internal-local to external-global tie exists is affected by the contact being a sponsor. In this analysis, whether or not an alter is a sponsor has no significant effect. If the internal contact were a sponsor of the partner, that person would also be a partner in the firm, so I controlled for where in the hierarchy the alters are located. Specifically, I examined whether they are superiors or whether they are situated below the partners in the hierarchy. The hierarchy variable comes out nonsignificant and thus has no effect on the type of ties that the individual partner has.

Interestingly, the binary logit analysis does reveal a positive and significant relationship between whether a tie exists from internal-local contacts to external-global contacts when one of the alters is someone the partner relies on for access to new knowledge and expertise. Similarly, for the connections internal-global to external-global contacts, I find that if one of the alters is someone the partner relies on to develop new knowledge and expertise will lead to there being a connection. These findings provide further support for Hypotheses 3 and 4, which posit that higher density of connections between the internal- and external-global contacts will positively affect the partners' ability to create new knowledge.

It might be argued that the results are simply an indication of the partners' overall performance rather than specifically of their innovation performance. Innovation performance is only slightly correlated with the financial performance measure at 15 percent, but to be sure, I ran the fully specified models on the financial performance of the individual partner, that is, the partners' contribution to the firm in terms of margin and revenue. These results show that the outcomes on financial performance differ from those on innovation performance, which suggests that the results are not

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simply an artifact of high-performing partners, but rather that different performance measures generate different outcomes and, hence, that the partners rely on different parts of their network for different purposes.

In that analysis I also controlled for innovation performance to see if the partners who are innovative actually create value for the firm. The innovation performance measure is positive and significant throughout indicating that those partners who are innovative do create financial value for the firm. Yet, perhaps it is actually the rainmakers that appropriate the knowledge that other partners have created and they are themselves not innovative. The only way to know this for sure would be to track the knowledge the partners create—something I am unable to do in this study.[11]

DISCUSSION AND CONCLUSION

In this paper, I set out to grasp how individual managers in global firms utilize their informal networks to create knowledge. Building on extant theory on innovation in social networks, as well as knowledge sharing in MNEs, I have developed a better understanding of how network structure affects the ability of individual managers to innovate. In particular, I showed that depending on the heterogeneity of the context, different network strategies are likely to be optimal for innovation performance. I proposed that when operating in a homogeneous context managers are likely to have difficulties accessing the diverse information and knowledge necessary for new knowledge creation. In such a context, they benefit from open networks characterized by low density. In contrast, in heterogeneous contexts where managers are exposed to diverse information and knowledge, the bigger challenge is interpreting and integrating this diverse information. Here managers benefit from a dense network, which allows for close interaction. The following sections elaborate on the implications of the findings.

Implications for knowledge creation in MNEs

This study answers the call for furthering our understanding of the challenges that individual managers in MNEs face and the (network) strategies they may employ to overcome them in order to improve their performance (Birkinshaw and Pedersen, 2008; Foss and Pedersen, 2004). The findings support the view that operating in the heterogeneous context of the MNE gives managers an advantage in terms of access to diverse information (Nohria and Ghoshal, 1997; Haas, 2006), yet this also creates challenges for individual managers in terms of integration of diverse information (Maskell, 2001). Specifically, I found that inside the firm or among clients, there are benefits in terms of innovation from keeping the local and global knowledge domains separate (low network density). This is likely because the local and global contacts connect into different knowledge domains and thus give the partners access to diverse information and knowledge. Further, the findings revealed that when crossing both firm and geographic boundaries there are benefits to dense network connections, as there likely are significant challenges to integration of knowledge once managers are crossing these boundaries. While literature on the MNE has outlined the benefits and challenges associated with operating in such heterogeneous contexts, little work exists that looks at individual strategies for how to best profit from or overcome these challenges. While I am unable to study the underlying individual-level mechanisms *in depth* in this paper, the qualitative data has given me some indication of the mechanisms at work. In particular, the partners talked about their ability to draw on informal network ties to access diverse information, knowledge, and work practices, particularly when these cut across geography. They also discussed how exchanges with their colleagues helped them interpret and integrate diverse information, and further suggested that this could be a deliberate strategy of bringing together contacts in their network. Furthermore, the survey data allowed me to look specifically at the differences in effects of different network structures on individual innovation performance. As such, this study is novel in its approach in that it examines individual performance effects in an MNE context.

Moreover, previous research studying knowledge transfer in the MNE has tended to explore exchanges of information and knowledge either

[11] McEvily, Jaffee and Tortoriello (2009) in a recent study of law firms suggest that lawyers who acquire valuable knowledge early in their careers may be able to bring this knowledge to new firms where their networks are nonredundant, and potentially use this knowledge to explore new opportunities for the firm. The authors therefore argue that individuals with bridging ties will be able to explore their knowledge long after it is created. Yet, they do not track the actual innovation, only the relationship. Thus, this may be worthy of future study.

inside firms (e.g., Hansen and Løvås, 2004; Gupta and Govindarajan, 2000) or between firms (e.g., McEvily and Zaheer, 1999). Most studies, while acknowledging that managers in MNEs have connections both inside and outside the firm, have, however, neglected to explore both dimensions simultaneously. Analyzing ties inside and outside of the firm separately allowed for an understanding of those dimensions in isolation. If they are completely independent, then this suffices. Yet, if there are, as I show here, interactions between the internal and external dimensions, and these interactions further have performance implications, then we need to explore the two dimensions simultaneously. This is something to consider for future studies on knowledge flows in MNEs.

Furthermore, by distinguishing between the different ties that these managers have, I am able to disentangle some of the differences that exist between these different types of ties. Different ties have different characteristics and will, therefore, provide different uses and benefits. In particular, because actors in the network have different positions and different objectives, exchanges between some actors will differ from exchanges between other actors (Gould and Fernandez, 1989). This means that the content that flows in the ties will differ (Ibarra and Andrews, 1993; Podolny and Baron, 1997). For example, I found that the partners in this firm relied primarily on their internal ties to create new knowledge, but on their external-local ties for revenue generation. These differences would not have emerged had I not distinguished between the different types of network ties in the partners' networks. Separating between different types of ties thus allows for a better understanding of how different parts of the network are used differently, and how different parts of the network provide different benefits (see Hansen, Mors, and Løvås, 2005).

More importantly, the fact that managers can utilize the different parts of their network differently has implications for how they build and maintain their networks. It is costly to build and maintain network ties, and managers therefore have to make trade-offs when deciding which networks to build and maintain (Hansen, Podolny, and Pfeffer, 2001). Hence, there are implications for how managers might think about their network strategies, which, in turn, may aggregate to performance implications at the firm level for MNEs. Consequently it is valuable to be able to consider the effects of different types of ties and network structures on managerial innovation performance. Future research on MNEs will therefore benefit from taking similar steps toward examining individual-level effects and distinguishing explicitly between different types of network ties.

Implications for network theory

Previous research taking a network theoretical perspective on innovation has established that an open network might be beneficial for innovation performance. In particular, it has been assumed that when the contacts in an individual's network are disconnected, they tap into different knowledge domains and thus become innovative (Burt, 2004; Reagans and Zuckerman, 2001; Ruef, 2002). Yet, more recent work has shown that there might also be benefits from closed networks that facilitate the sharing of ideas and information, which, in turn, may lead to innovation outcomes (e.g., Obstfeld, 2005; Tortoriello and Krackhardt, 2010). These findings seem contradictory. Perhaps, as Rodan and Galunic (2004) suggested, this is because while network structure may be an indicator of heterogeneity of knowledge, it is not a perfect proxy.

In this paper, I have shown that, in fact, these perspectives may not be contradictory. The optimal network structure rather depends on the heterogeneity of the context in which managers operate. Specifically, the results revealed that inside the firm, where heterogeneity of information and knowledge generally is low, those partners who have lower density of connections between their local and global contacts have higher innovation performance. This finding resonates with extant work, which posits that lower density in the network is likely to positively influence exposure to diverse information and, in turn, have a positive effect on innovation (Burt, 2004; Reagans and Zuckerman, 2001) and performance in general (Burt, 2004; Rodan and Galunic, 2004). This also indicates that inside the firm interpreting and integrating diverse information poses few problems. It makes sense as individuals are more similar within than between firms as they share work practices, have common processes for sharing information and knowledge, and also share a common organization culture. Thus, it may be easier for them to share knowledge inside the firm (Argote and Ingram, 2000). Then the bigger challenge inside

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the firm is rather to *access* diverse information and knowledge.

Similarly, in the relationships between external contacts, that is, a partner's clients, I found that those partners with low density of connections between the local and global contacts in their networks have higher innovation performance. This seems intuitive. If a partner is connected to clients and other contacts external to the firm who operate in different contexts, it is more likely that the partner will be able to learn new things. The idea is that gaining access to diverse information is not necessarily only about having nonredundancy in managers' networks but also about having connections that allow managers to tap into different environments (Reagans *et al*., 2004).

On the contrary, when spanning firm boundaries, it is likely that managers are exposed to heterogeneous information and knowledge (e.g., Tushman, 1977). Thus, the challenge is no longer just how to access diverse information but also how to *integrate* this information. I found no support for the hypotheses that higher network density between the internal- and external-local ties leads to higher innovation performance. Perhaps when crossing the firm boundary the challenges of access to diverse information are equal to those of integration. Hence, the effects cancel each other out. However, once the partners are also crossing the geographic boundary, I found a positive and significant effect of increased network density on innovation performance. Thus, it is only when crossing both the firm and geographic boundaries that the heterogeneity of the context is such that the challenge of integration of diverse information outweighs the challenges of access to diverse information. Hence, here the problem is *too much diversity*, and in such a context managers benefit from a dense network.

In sum, this paper brings some clarity to these seemingly contradictory views within network theory by showing whether it is better to have dense network connections or less redundancy in the network, at least in this setting, depends on the physical location of the contact, which will affect the heterogeneity of the knowledge to which an actor is exposed. In this respect, the findings are in line with recent work showing that the characteristics of the setting have implications for the formation of networks (Sorenson and Stuart, 2008). I here extend this work to show that the context also has implications for the effects of network structure on performance. Other recent work has found an overall link between structure and performance: Davis, Eisenhardt, and Bingham (2009) show that when actors are faced with too much structure, they are likely constrained in terms of their actions and their performance may suffer. Similarly, too little structure will leave actors unguided and have negative performance implications. My arguments differ in that they are contingent upon the context in which individuals operate. I show that in certain contexts actors benefit in terms of innovation performance from less structure, and in other contexts they may benefit from more structure. Overall, these findings support the view that actors may gain from more deliberate network strategies in terms of innovation (e.g., Obstfeld, 2005). In this case, when the context is homogeneous actors should aim for less structure, and when the context is heterogeneous they should aim for more structure in their networks.

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Appendix: Results from ordinary least square regression analyses on innovation performance[a]

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Constant	4.58***	3.27*	3.23*	3.29*	3.78*	2.71†	2.79***
	(1.38)	(1.50)	(1.44)	(1.41)	(1.69)	(1.59)	(0.15)
Age	−0.04	−0.04	−0.03	−0.03	−0.04	−0.02	
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	
Education	0.14	0.25	0.22	0.24	0.24	0.24	
	(0.20)	(0.21)	(0.19)	(0.19)	(0.19)	(0.19)	
Time to partner	−0.03	−0.03	−0.04	−0.04	−0.04	−0.03	
	(0.04)	(0.05)	(0.04)	(0.04)	(0.05)	(0.04)	
Process	−0.01	0.12	0.19	0.20	0.18	0.30	
	(0.38)	(0.42)	(0.38)	(0.38)	(0.41)	(0.40)	
Change	−0.75†	−0.73†	−0.63	−0.62	−0.60	−0.53	
	(0.39)	(0.40)	(0.39)	(0.40)	(0.42)	(0.38)	
Technology	−0.01	0.12	0.37	0.36	0.36	0.57	
	(0.33)	(0.35)	(0.35)	(0.36)	(0.37)	(0.36)	
Comm. high tech.	0.03	0.16	0.22	0.21	0.18	0.06	
	(0.29)	(0.31)	(0.31)	(0.30)	(0.32)	(0.31)	
Financial services	−0.23	−0.12	−0.00	−0.00	−0.04	0.06	
	(0.28)	(0.26)	(0.28)	(0.29)	(0.29)	(0.29)	
Products	0.54†	0.51†	0.63*	0.62†	0.59†	0.55†	0.43†
	(0.31)	(0.30)	(0.32)	(0.32)	(0.32)	(0.30)	(0.24)
Government	1.11**	0.98	0.92†	0.90†	0.85	0.40	
	(0.43)	(0.63)	(0.50)	(0.48)	(0.53)	(0.55)	
Network size	0.02		0.03	0.03	0.02	0.03	
	(0.03)		(0.03)	(0.03)	(0.03)	(0.03)	
Size internal-local		0.05					
		(0.03)					
Size internal-global		0.08					
		(0.06)					
Size external-local		0.02					
		(0.04)					
Size external-global		0.12					
		(0.17)					
Egocentric density	−1.33						
	(1.02)						
Density internal-local		0.00	0.08	0.06	0.25	−0.08	
		(0.51)	(0.55)	(0.54)	(0.60)	(0.55)	
Density internal-global		0.45	1.27*	1.31**	1.31**	1.50***	1.01**
		(0.44)	(0.51)	(0.50)	(0.50)	(0.44)	(0.38)
Density external-local		−0.44	−0.45	−0.45	−0.35	−0.60	
		(0.44)	(0.38)	(0.39)	(0.41)	(0.42)	
Density external-global		−1.20	0.24	0.35	0.37	−1.99†	−2.11**
		(1.61)	(0.99)	(0.87)	(0.84)	(1.19)	(0.66)
H1: Density internal-local to internal-global			−1.83*	−1.81†	−2.02*	−2.30**	−1.03
			(0.91)	(0.93)	(0.92)	(0.85)	(0.77)
H2: Density external-local to external-global				−0.54	−0.56	−2.66*	−2.78***
				(1.60)	(1.52)	(1.32)	(0.58)
H3a: Density internal-local to external-local					−1.07	0.15	
					(1.21)	(1.28)	
H3b: Density internal-global to external-local					0.71	0.09	
					(1.24)	(1.23)	
H4a: Density internal-local to external-global						6.45*	6.34***
						(2.95)	(1.64)
H4b: Density internal-global to external-global						2.67*	2.56***
						(1.20)	(0.54)

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Appendix (*Continued*)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Fit[b]	2.85**	2.65**	2.83**	2.63**	2.28**	5.57***	16.43***
R-squared	0.26	0.33	0.32	0.32	0.33	0.44	0.25

[a] Ordinary least squares regressions. Dependent variable: innovation performance. N=79. Robust standard errors in parentheses. †$p < 0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$ (two-tailed test for variable coefficients).
[b] F-test.

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