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In Good Company: When Small and Medium-Sized Enterprises Acquire Multiplex Knowledge from Key Commercial Partners*

by Ana Maria Bojica, Isabel Estrada, and María del Mar Fuentes-Fuentes

This study explores the specific conditions under which key strategic alliances of small and medium-sized enterprises (SMEs) with commercial partners can become multiplex in knowledge exchange. Using survey data from a sample of 150 Spanish SMEs in the information and communication technology (ICT) industry, we find that trust creates an appropriate context for the concurrent acquisition of technological, market, and managerial knowledge. When the SME and its key commercial partner exhibit significant strategic, technological, and market differences, however, the SME's ability to acquire different types of knowledge diminishes considerably, reducing the positive impact of trust on knowledge multiplexity.

Introduction

SMEs must resort to external sources to fill their knowledge gaps and respond to competitive and innovation challenges, particularly in dynamic environments (Colombo et al. 2012; Coombs, Mudambi, and Deeds 2006; Rothaermel and Deeds 2004). Innovating and developing sustainable competitive advantage often require the simultaneous acquisition of different types of new knowledge, including technological (Sullivan and Marvel 2011), market (Shane 2000), and managerial knowledge (Davidsson and Honig 2003). Commercial partners—such as clients, suppliers, and distributors—are a key source of external knowledge for SMEs (Lipparini and Sobrero 1994; Werr, Blomberg, and Lowstedt 2009). Clients, for instance, can provide valuable

insights into market and technological trends (for example, Shepherd and DeTienne 2005; Yli-Renko, Autio, and Sapienza 2001), sustaining SMEs' efforts to introduce new products into the market.

Recent studies emphasize that SMEs can find the knowledge needed to compete and innovate more efficiently and effectively by developing multiplex relationships with a key commercial partner rather than through multiple partnerships (Gaur et al. 2011; Lowik et al. 2012). Acquisition of multiplex knowledge—that is the concurrent acquisition of technological, market, and managerial knowledge through the same relationship (Albrecht and Hall 1991; Sammarra and Biggiero 2008)—diminishes the costs of accessing different sources, generates flexibility, and thus facilitates

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adaptation of the knowledge to the firm's needs, mitigating redundancy and favoring the creation of new knowledge (Burt 1992; Mahmood, Zhu, and Zajac 2011; Uzzi 1996).

The existing literature provides preliminary evidence on the important advantages that acquisition of multiplex knowledge in relationships with key commercial partners might entail for SMEs. However, our comprehension of the specific conditions under which such relationships actually provide SMEs with access to multiple types of new knowledge (for example, technological, market, and managerial) remains extremely limited. Without understanding these conditions, academic research will remain unable to provide useful recommendations for SMEs on how to take advantage of valuable relationships with commercial partners to satisfy their external knowledge needs in efficient ways.

Our paper aims to fill this research gap and analyze the conditions under which relationships of SMEs with key commercial partners are likely to become multiplex. To accomplish this research objective, we focus on two key characteristics of such relationships (trust and interpartner dissimilarity) and theorize how they play out in the context of knowledge multiplexity. We ground our arguments in the premises that social characteristics of relationships condition the breadth and depth of the exchange (Granovetter 1985; Uzzi 1996) and that the knowledge exchange depends on the partners' opportunity, motivation, and ability to transmit and acquire knowledge (Argote, McEvily, and Reagans 2003; Lane and Lubatkin 1998; Lane, Salk, and Lyles 2001). Building on prior interorganizational learning research, we argue that trust enacts both the opportunity and motivation to exchange multiple knowledge types, whereas interpartner dissimilarity constrains the SME's ability to acquire such variety of knowledge. In the context of SMEs' relationships with key commercial partners, we hypothesize that there is a positive relationship between trust and the acquisition of multiplex knowledge, which is negatively moderated by interpartner dissimilarity.

Using survey data from a sample of 150 Spanish SMEs in the ICT industry, we find empirical support for our theoretical predictions. Our analysis confirms that trust creates the appropriate context for the concurrent acquisition of technological, market, and managerial knowledge. When the SME and its key commercial partner exhibit significant strategic, technological, and market differences, the SME's

ability to acquire different types of knowledge diminishes considerably, reducing the positive impact of trust on knowledge multiplexity.

This study contributes to the existing literature by illuminating some important conditions under which SMEs may acquire multiplex knowledge from their relationships with key commercial partners. We thus complement previous research by expanding the scope of analysis from within the organization to the relational conditions necessary for developing knowledge multiplexity within a relationship (Lowik et al. 2012). We bring into play a new variable, the degree of dissimilarity between partners, which conditions indirectly the degree of knowledge multiplexity. Additionally, we advance knowledge on the role of trust in knowledge acquisition in the setting of key interorganizational relationships of SMEs. Previous evidence on this issue is mixed, indicating both positive and negative effects. Our approach and the study's results suggest that trust may play different roles, depending on the content of the knowledge to be acquired. Trust favors the acquisition of multiplex knowledge, but the overembeddedness trap could render trust less beneficial when the scope of knowledge acquisition is narrower, by insulating firms from other external sources of knowledge.

This paper is organized as follows. First, we provide the conceptual framework and our research hypotheses. Second, we present the study methodology. Subsequently, we provide our empirical analysis and findings. In the final section, we discuss the findings, implications, and limitations of the study, and suggest promising lines for future research.

Conceptual Background and Hypotheses

Because SMEs have fewer assets to build their strategies than large firms, they rely to a greater extent on knowledge resources to compete successfully (Colombo et al. 2012; Gaur et al. 2011; Thorpe et al. 2005; Wiklund and Shepherd 2003; Yli-Renko, Autio, and Sapienza 2001). The most important external knowledge sources for SMEs are commercial partners (Lipparini and Sobrero 1994; Werr, Blomberg, and Lowstedt 2009). Though customers and distributors usually provide new knowledge that can challenge existing routines, suppliers provide industry-embedded knowledge that helps SMEs to integrate new knowledge and reduce uncertainty (Mesquita and Lazzarini 2008; Simmie

2002; Thorpe et al. 2005). Developing knowledge acquisition relationships with commercial partners—clients, suppliers, distributors—enables strategic responses to resource restrictions, particularly for SMEs in dynamic and innovative markets (Liao, Welsch, and Stoica 2003; Meeus, Oerlemans, and Hage 2001).

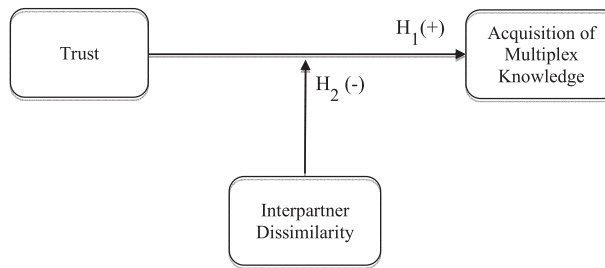
Though some studies argue that SMEs should develop a diverse network of partners (for example Lechner, Dowling, and Welppe 2006), others point to the constraints that doing so might place on SMEs due to their limited absorptive capacity (Van Wijk, Jansen, and Lyles 2008). Large firms can usually exploit broad portfolios of alliances with multiple external partners, which constitute potential sources of rich external knowledge (Faems et al. 2010; Van Wijk, Jansen, and Lyles 2008). SMEs, however, usually lack the resources and capabilities needed to manage simultaneous relationships with multiple partners (Colombo et al. 2012; Sarkar, Aulakh, and Madhok 2009). SMEs' natural preference for closer relationships with a limited number of external partners (Roessl 2005; Stuart 2000) usually confines their alliance activity to a small group of strategic partners, often to a single relationship with a key commercial partner. Still, some recent studies suggest that a single relationship with a key commercial partner can support SMEs' strategic and innovative development by facilitating access to multiple types of knowledge (Lowik et al. 2012; Sammarra and Biggiero 2008). This reasoning leads to the concept of "knowledge multiplexity" (Albrecht and Hall 1991), which is rooted in the broader social network theory notion of multiplexity (Burt 1992; Verbrugge 1979).

Broadly speaking, multiplexity is a tie characteristic indicating the extent to which actors share multiple bases for interaction within a single relationship (Burt 1992; Ferriani, Fonti, and Corrado 2012; Verbrugge 1979). Multiplexity is thus "the breadth of the involvement of participating organizations" (Kim, Oh, and Swaminathan 2006, p. 711). The literature includes a variety of relationships under the label "multiplex," in which partners play different roles (co-opetition, relationships in which economic and personal ties overlap), have different types of affiliations, or perform different types of resource exchange (for example Aalbers, Dolfsma, and Koppius 2013; Dhanaraj and Parkhe 2006; Zerbinì and Castaldo 2007). Following these studies, Albrecht and Hall (1991) introduce the notion of knowledge multiplexity. Relationships can be multiplex because

they constitute a channel through which the parties involved exchange multiple types of knowledge. Extending this notion to our study context, we posit that knowledge multiplexity exists when the SME and its commercial partner concurrently exchange multiple types of knowledge (Albrecht and Hall 1991)—namely technological, market and managerial knowledge (Sammarra and Biggiero 2008).

Some scholars suggest that developing a single strong relationship with a valuable partner may be a more efficient way for SMEs to access required knowledge than developing a portfolio of relationships with multiple partners (Lowik et al. 2012). Multiplexity in exchange relationships decreases the cost of accessing different sources and generates flexibility in the use of resources, facilitating their adaptation to the firm's needs (Uzzi 1996). Because sensing and seizing new entrepreneurial opportunities require multiple knowledge domains, acquiring multiplex knowledge from a single partner provides several benefits to the firm. Such domains include market knowledge (for example, Shane 2000; Tang and Murphy 2012; Zahra, Korri, and Ji 2005), technological knowledge (for example, Sullivan and Marvel 2011) and managerial knowledge (for example, Camisón and Villar-Lopez 2014; Davidsson and Honig 2003). Wiklund and Shepherd (2003, pp. 1308–1309) stress that technological knowledge "can lead to a technological breakthrough that represents an opportunity despite its market applicability not being readily apparent," whereas market knowledge increases the firm's ability "to determine the market value of new scientific discoveries." Transfer of one type of complex knowledge often requires concurrent transfer of other types of knowledge to ensure comprehensiveness and applicability. For example, managerial knowledge frequently complements acquisition of technological and/or market knowledge, even though it is not included in the intentional scope of the alliance (Sammarra and Biggiero 2008). Knowledge multiplexity also provides advantages for instrumental action, decreasing the redundancy associated with ongoing interaction with a single actor and allowing entrepreneurial firms to satisfy a broader range of knowledge needs (Burt 1992). Further, knowledge multiplexity promotes new knowledge creation by increasing the range of knowledge resources available in the relationship and thus the possibilities for combination (Mahmood, Zhu, and Zajac 2011). Uzzi and Gillespie (2002), for

Figure 1
Conceptual Model: SMEs' Acquisition of Multiplex Knowledge from Key Commercial Partners



example, find that SMEs that develop multiplex relationships with their banks gain benefits in terms of increases in the amount of trade-credit discounts, since they provide the bank with incentives to share know-how.

Previous studies in the SME literature focus on acquisition of knowledge from different domains, primarily market and technology knowledge, and the impact this knowledge has on different outcomes, such as new product development and technological distinctiveness (for example, Yli-Renko, Autio, and Sapienza 2001), firm innovativeness (for example, Sullivan and Marvel 2011), and the profits that new products yield in their first year of life on the market (for example, Brockman and Morgan 2003). Though these studies show that acquiring different types of knowledge has a positive impact on performance, research has not systematically analyzed the situation in which different types of knowledge are acquired concurrently from the same relationship. Moreover, while multiplexity has been conceptualized as an important tie characteristic that can provide several benefits, little is known about the conditions under which multiplexity develops in interorganizational relationships (Ferriani, Fonti, and Corrado 2012; Kuwabara, Luo, and Sheldon 2010). In this study, we focus explicitly on the phenomenon of knowledge multiplexity to determine when knowledge exchange between an SME and a key commercial partner is likely to become multiplex.

Building on the premise that knowledge exchange in a relationship depends on the partners' opportunity, motivation and ability to transmit and acquire knowledge (Argote, McEvily, and Reagans 2003; Lane and Lubatkin 1998; Lane, Salk, and Lyles 2001), the following

sections argue that trust and interpartner dissimilarity condition the scope of the knowledge acquisition activities. We define trust as a willingness to be vulnerable to the other party's actions, based on the expectancy that it will behave correctly, independently of being monitored or controlled (Mayer, Davis, and Schoorman 1995; Steensma and Lyles 2000; Uzzi 1997). We use the term interpartner dissimilarity to indicate comparative interorganizational differences between the two partners (Parkhe 1991). Focusing on the concurrent acquisition of technological, market, and managerial knowledge, we evaluate the partnering firms' degree of dissimilarity in technological capabilities, markets served and competitive strategy (Kim and Parkhe 2009). We argue that a high level of trust between partners promotes acquisition of multiplex knowledge (Robson, Katsikeas, and Bello 2008), while SMEs' ability to acquire such knowledge depends on the degree of interpartner dissimilarity.

Figure 1 shows our conceptual model.

Influence of Trust on Acquisition of Multiplex Knowledge

Trust is an important mechanism governing alliances, as it facilitates knowledge transfer (Argote, McEvily, and Reagans 2003; Das and Teng 1998; Dyer and Singh 1998; Nahapiet and Ghoshal 1998). More specifically, trust facilitates knowledge sharing and speeds knowledge acquisition across firm boundaries by reducing costs associated with both cooperation and coordination (Dyer and Singh 1998; Meier 2011). Trust mitigates the necessity to monitor the partner's behavior (Dyer and Chu 2000) and supports the creation of interorganizational

routines for communication and information-sharing (Robson, Katsikeas, and Bello 2008; Zaheer, McEvily, and Perrone 1998). It can thus reduce monitoring and bargaining costs generated by contractual control, reinforce contract effectiveness, and allow the firm to devote more resources to learning (Brunetto and Farr-Wharton 2007; Das and Teng 1998; Gaur et al. 2011). In support of these arguments, several studies report a positive relationship between trust in interorganizational relationships, and knowledge transfer processes and outcomes (Becerra, Lunnan, and Huemer 2008; Meeus, Oerlemans, and Hage 2001; Molina-Morales and Martínez-Fernández 2010; Nielsen and Nielsen 2009).

Trust is also a key driver of relationship multiplexity (Ferriani, Fonti, and Corrado 2012; Uzzi 1997). We argue that trust in interfirm relationships between an SME and a key commercial partner promotes an appropriate context for acquisition of multiplex knowledge by providing both opportunity and motivation to exchange multiple types of knowledge. Trust creates opportunity because it promotes interaction in multiple domains (Robson, Katsikeas, and Bello 2008; Uzzi 1996). Reducing fear of being exploited increases the likelihood of knowledge exchange (Ferriani, Fonti, and Corrado 2012). As partners gain confidence in each other, they broaden their scope of interaction, producing more opportunities to exchange more extensive information and encouraging the flow of different types of knowledge (Faems et al. 2008; Ferriani, Fonti, and Corrado 2012; McEvily, Perrone, and Zaheer 2003). The expectation that the partner will not behave opportunistically also ensures consistency in the cooperative behavior, even when the environment changes (Gulati and Gargiulo 1999). Trust thus encourages partnering firms to adjust to changing environmental demands (Young-Ybarra and Wiersema 1999). Such adaption could involve extending the range of knowledge exchange to new domains, thereby encouraging knowledge multiplexity within the relationship. In knowledge-intensive contexts such as the ICT industry, firms in alliances are more prone to sharing full information when their relationships are characterized by trust to mitigate the high levels of uncertainty (Gaur et al. 2011; Krishnan, Martin, and Noorderhaven 2006). Further, concurrent acquisition of technology, market and managerial knowledge is a complex process that requires trust between the parties involved

to succeed (Kirkels and Duysters 2010; Meier 2011; Scott 2006).

Trust creates motivation to exchange multiple types of knowledge. Where there is trust, partners are willing to provide additional, detailed, accurate, timely information (Mohr and Spekman 1994) to ensure that the other party can understand and assimilate the knowledge transferred (Dhanaraj et al. 2004; Inkpen 2000). Such exchange can involve transfer of different kinds of complementary knowledge, enhancing knowledge multiplexity. In studying the aerospace industry cluster in Rome, Sammarra and Biggiro (2008) conclude that firms concurrently exchange technological, market, and managerial knowledge in collaborative innovation relationships when they stimulate both formal and informal interaction between members and groups from the partnering organizations. According to these authors, such interaction fosters, for example, transfer of both technological and managerial knowledge on how to implement and exploit the knowledge in the organization.

Several studies provide evidence that trust favors acquisition of multiplex knowledge in interorganizational relationships. Ferriani, Fonti, and Corrado (2012) show that prior social interaction is a more significant driver of relationship multiplexity than prior instrumental exchange alone. Uzzi (1996, 1997) finds that trust facilitates emergence of economic multiplex exchange, as it enables resources to flow between the parties. Similarly, Larson (1992) finds that norms of reciprocity in relationships with customers and suppliers lead to exchange of a broad range of knowledge through these relationships. In a multiple case-study analysis of small technology firms, Lowik et al. (2012) show that strong, trust-based ties with a single partner are an important condition for leveraging multiplexity in a relationship. Based on these arguments and evidence, we propose our first hypothesis:

H1: In the setting of a relationship between an SME and a key commercial partner, trust is positively associated with acquisition of multiplex knowledge.

The Moderating Impact of Interpartner Dissimilarity

The foregoing discussion suggests that trust generates a favorable context for knowledge multiplexity by providing partners with motivation and opportunity to exchange multiple types

of knowledge. This section argues that interpartner dissimilarity can diminish the SME's ability to acquire multiplex knowledge from such a context by conditioning the real effects of trust on multiplex knowledge acquisition.

First, interpartner dissimilarity has implications for the type of knowledge to be exchanged. Dissimilar partners are likely to possess unrelated knowledge, making it difficult for them to absorb each other's knowledge (Cohen and Levinthal 1990; Lane and Lubatkin 1998). Such unrelated knowledge triggers knowledge ambiguity (Simonin 1999a, 1999b), that is, the partners' "lack of understanding of the logical linkages between actions and outcomes, inputs and outputs, and causes and effects" (Simonin 1999a, p. 597) in each other's knowledge. Knowledge ambiguity in turn affects the SME's ability to recognize, evaluate and assimilate knowledge (Zahra and George 2002) from the commercial partner. When the SME does not recognize the value of a commercial partner's knowledge (Lane and Lubatkin 1998), the partner's attractiveness as a knowledge source decreases, reducing the SME's motivation to invest in learning (Pérez Nordtvedt et al. 2008). Even when the SME realizes the value of the knowledge, knowledge ambiguity can jeopardize the process of knowledge transfer across organizational boundaries (for example Lane, Salk, and Lyles 2001; Simonin 1999a). Studying international joint ventures, for instance, Lane, Salk, and Lyles (2001) conclude that parents businesses' differences substantially reduce the joint venture's ability to understand and assimilate managerial and market knowledge from the foreign parent. Lee and Monge (2011) find that resource similarity of project organizations encourages exchange of multiple knowledge types by facilitating mutual understanding.

Interpartner dissimilarity may also condition the effects of trust on knowledge multiplexity through the process of joint interaction and coordination. Interpartner dissimilarity accentuates differences in the partners' organizational routines and mindsets in general (Lavie, Haunschild, and Khanna 2012; Parkhe 1991) and in the knowledge management domain in particular (Lane and Lubatkin 1998). Interpartner dissimilarity hinders the emergence of common expectations (Kim and Parkhe 2009) and leads to different visions of the actions required to attain expected outcomes (Pothukuchi, Damanpour et al. 2002). Further, interfirm knowledge transfer requires interaction between the partners' knowledge systems (Dyer and Singh

1998). Interpartner similarity thus facilitates coordination of the tasks that the SME and its key commercial partner must undertake to exchange knowledge, whereas dissimilarity complicates such joint actions (Lane and Lubatkin 1998). Studying research and development alliances in biotechnology, Lane and Lubatkin (1998) show that similarity in the partners' knowledge-processing systems promotes assimilation of technological knowledge by facilitating joint routines for knowledge acquisition, storage, and transfer.

In sum, interpartner dissimilarity diminishes the SME's ability to acquire knowledge from the commercial partner by (i) involving knowledge that is inherently difficult to transfer, and (ii) creating difficulties in coordinating the knowledge transfer process. These effects may be especially strong in the context of our study because SMEs usually lack sophisticated routines for external knowledge absorption (Autio, Sapienza, and Almeida 2000; Lane, Koka, and Pathak 2006). Under conditions of interpartner dissimilarity, trust-based mechanisms of motivation and opportunity may not materialize in the acquisition of multiplex knowledge:

H2: In the setting of a relationship between an SME and a key commercial partner, interpartner dissimilarity negatively moderates the impact of trust on acquisition of multiplex knowledge.

Methods

Sample and Data Collection

The hypotheses were tested using a sample of 150 Spanish SMEs in the ICT sector. According to the Spanish National Statistics Institute's definition, which follows the International Standard Industrial Classification of all Economic Activities (Rev. 3), this economic sector is composed of firms whose activity is linked to the development, production, release in the market, and intensive use of ICT. Our purposeful sampling in this specific sector permits us to control to a certain extent for variance in external environment, ensuring in turn that all firms in the sample act in a dynamic environment, where being entrepreneurial is relevant for survival and development. The selection criterion employed for SMEs was number of employees. Following the EU's Fourth Directive 78/660/CEE, we considered small firms to be those with

fewer than 50 employees and medium-sized firms those with 50 to 250 employees.

The sample of firms in this study was selected randomly from the SABI database (Iberian Balance Sheet Analysis System), which contains company accounts, ratios, activities, ownership, and management data for over a million Spanish companies. In 2008, the SABI database contained 22,103 SMEs from the ICT sector. To collect the data about the relationship with the main strategic partner, we used a structured questionnaire addressed to general managers of the SMEs. Because of their direct involvement in almost every strategic activity of the firm and their key role in decision-making, SMEs' CEOs and general managers are considered to be particularly knowledgeable informants (for example Lee et al. 2012; Sawang, Parker, and Hine 2016). In particular, they are very well positioned to identify who is the most strategic partner of the firm and to report on the characteristics and outcomes of such relationship (Gaur et al. 2011; Kumar, Stern and Anderson 1993). In designing the questionnaire, we also followed recommendations to mitigate common method biases (Podsakoff et al. 2003). To reduce item ambiguity and ensure that respondents would understand the questions clearly, we performed a pre-test using 20 general managers of small firms not included in the final sample. Some minor changes were introduced to the questionnaire as result of this pre-test. Furthermore, to enhance accuracy in responses and mitigate retrospective biases, the questionnaire consisted of a relatively limited number of questions, which referred to the SMEs' strategic activities over the last three years. All of the data used in the research were collected through this questionnaire. To further improve accuracy and reduce social desirability biases, we also made clear that there were no right or wrong answers and that the data were confidential and would only be used in aggregate form.

We contacted the general managers of the SMEs by telephone between January and March of 2008, using computer-assisted telephone interviewing (C.A.T.I.) to collect the data.¹ We

first randomly approached 896 firms and obtained 215 responses (23.99 percent response rate). After excluding the incomplete responses, the sample decreased to 203. From this sample, we selected the firms that indicated that their most important strategic partner was a commercial partner and those that had a formal cooperation agreement to ensure a partnership, not just occasional cooperation. Our final sample was composed of 150 cases of SMEs that reported formal strategic relationships with commercial partners, including clients, suppliers, distributors, and others. We conducted an unpaired t-test to check for nonresponse bias. The mean differences between the samples of responding and nonresponding companies along dimensions such as annual sales, number of employees, registered capital, and profits were nonsignificant.

A brief descriptive analysis of our sample shows that 68.7 percent of the firms were more than five years old. Only 14 percent fall into the category of newly created firms (1–3 years in the market), and 17.4 percent were 3–5 years old. 6.2 percent of the firms surveyed are micro-firms, with fewer than 10 employees. 55.9 percent employ 10–50 workers, and the rest report having 50 to 250 employees. 33 percent are manufacturing firms, 44 percent are service firms, and the rest belong to the commercial sector. 74.5 percent of the firms surveyed stated that they had maintained the relationship for more than three years. When asked about the identity of this strategic partner, most of the managers referred to entities that participated in the daily life of the organization: 50.7 percent were clients, 24 percent providers, and 7.5 percent distributors. 10.7 percent were clients and providers, 2.7 percent clients and distributors, and 1.3 percent providers and distributors. In only 3.3 percent of the cases was the relationship classified simply as collaboration.

Measures

Dependent and independent variables were measured using indicators and multi-item scales based on previous studies, with items measured on a seven-point Likert scale (strongly agree-

¹In this telephone surveying technique, a computerized questionnaire is administered to respondents over the telephone. This technique allows to detect and solve inconsistencies in responses as data are collected, as well as to customize questions when needed (e.g., adapt the wording to enhance clarity or to incorporate relevant information from former answers) (Couper 2008). In our study, the telephone interviews lasted, on average, 20 minutes.

strongly disagree). The Cronbach alphas reported below show that all scales used in the questionnaire had a sufficient degree of convergent validity. All measures are available in the Appendix.

Dependent Variable. Acquisition of multiplex knowledge was measured using an indicator of the extent to which the firm had acquired three types of knowledge from its partner: market knowledge, technological knowledge, and management knowledge. We first asked the respondents to identify a strategic relationship with another organization they considered the most important for the subsequent development of their own organization. We then asked them to evaluate on a scale from 1 to 7 the extent to which they acquired each of the three types of knowledge. This procedure is consistent with the approach of Becerra, Lunnan, and Huemer (2008), who also focus on the most important strategic partner to evaluate how perceptions of trustworthiness and willingness to take risks affect knowledge transfer between alliance partners. We wanted to make sure that our indicator reflected acquisition of multiplex of knowledge only when the acquisition of each type of knowledge was actually relevant. When respondents indicated having acquired a particular type of knowledge to a level of 4 or higher, we considered that knowledge acquisition occurred to a significant extent. In each case, we coded the items that scored 4 or higher as 1, and the remaining cases as 0. We then built the knowledge acquisition indicator by aggregating the three dummy variables. In this way, we made sure that we exclude the cases in which acquisition of a certain type of knowledge occurred anecdotally or residually in the relationship with the key commercial partner. The maximum value of this indicator is thus 3 and the minimum 0. The higher the value of the indicator, the higher the multiplexity of the knowledge acquired, as the partners exchange more types of knowledge to a significant extent.

Independent Variables. Trust (T) was measured using the five-item scale developed by Dhanaraj et al. (2004) based on previous studies, such as that of Zaheer, McEvily, and Perrone (1998). We asked the respondents to evaluate how reliable, predictable and correct they perceived the behavior of their most important

strategic partner to be. The Cronbach's alpha calculated for this variable was 0.83.

Partner dissimilarity (D) was measured as "differences as perceived by one of the partners," following an approach similar to that of Saxton (1997), and Kim and Parkhe (2009). In the questionnaire, respondents were asked to evaluate on a scale from 1 to 7 the extent to which the commercial partner (i) had similar technological competencies, (ii) served similar markets, and (iii) followed similar strategies. In each case, we coded the items that scored less than 4 as 1 (that is, the partner exhibits high dissimilarity on that aspect), and the other cases as 0 (the partner does not exhibit high dissimilarity on that aspect). Subsequently, we built the dissimilarity indicator by aggregating the three dummy variables. The maximum value of this indicator is thus 3 (partners are highly dissimilar in all three aspects), and the minimum is 0. Our final variable indicates therefore how different the firms are with respect to the type of strategy they follow, the market they serve, and the technological competences they possess (Kim and Parkhe 2009; Saxton 1997; Parkhe 1991).

Control Variables. As control variables, we used the size and age of the firm, its knowledge-based resources, the duration of the relationship, and the role of the commercial partner (client, distributor, supplier, others). The size of the firm, measured by number of employees, age, and knowledge-based resources were used as control variables for the characteristics of the firm. We expect large and older firms endowed with high levels of knowledge-based resources to have developed better routines for knowledge acquisition than small young firms with few knowledge-based resources. The firm's knowledge-based resources were measured using the Likert scale from 1 to 7 developed by Wiklund and Shepherd (2003), following the instrument initially created by Gupta and Govindarajan (2000). The scale measures the firm's position with respect to its competitors in terms of organizational knowledge. The items refer to technological and technical knowledge, knowledge of the market, and managerial knowledge. The Cronbach's alpha calculated for this variable is 0.84.

To control for the characteristics of the relationship, we used the variable duration of the relationship, measured by the number of years since the tie was established. We expect long-term relationships to have a positive influence on knowledge acquisition because they are

more likely to have developed the characteristics of strong ties, which in the case of SMEs seem beneficial for the pursuit of learning (Lowik et al. 2012).

Main Analysis and Results

The relationships proposed were studied using a linear hierarchical regression analysis with moderating effects. Table 1 shows the correlations, means, and standard deviations of the study variables. The results of the different regressions are shown in Table 2. To rule out the possibility of any effect derived from multicollinearity, we performed a contrast to determine that the variance inflation factors (VIF) of the variables did not exceed 2, eliminating the possibility of multicollinearity in the first three models. In the last model, which introduces the interaction term, we followed the recommendation of Jaccard and Turrisi (2003) to center the means for these variables, subtracting the mean of the starting values and recalculating the product of the two, to rule out any effect derived from multicollinearity. On repeating the test for multicollinearity, we observed that the VIFs of the variables did not exceed 2, thus establishing that multicollinearity is not a concern.

Model I analyzes only the effect of the control variables, which explains with statistical significance 10.9% of the variation in acquisition of multiplex knowledge. As expected, the knowledge-based resources of the firm play a significant positive role in explaining acquisition of multiplex knowledge. None of the other control variables is significant at this stage. Model II includes the direct effect of the independent variables trust and interpartner dissimilarity. We can observe that the β coefficient is positive and statistically significant for trust ($\beta = 0.343$) and negative and statistically significant for interpartner dissimilarity ($\beta = -0.159$). We thus confirm the first hypothesis proposed. The introduction of these variables increases the model's explained variance to 0.247. In Model III, we introduce the interaction term between trust and interpartner dissimilarity. Incorporating this variable increases the model's total variance to 0.275. The corresponding beta coefficient is negative and statistically significant ($\beta = -0.188$), showing a negative moderating effect of dissimilarity on the relationship between trust and acquisition of multiplex knowledge and thus confirming our second hypothesis. We also observe that the direct effect of interpartner dissimilarity becomes nonsignificant when the interaction term is introduced. Thus, dissimilarity

plays a more indirect role in explaining acquisition of multiplex knowledge, conditioning the relationship between trust and knowledge multiplexity, rather than affecting directly the variety of knowledge types acquired from the commercial partner.

Post-Hoc Analyses

In order to test for the robustness of our findings, we conducted a number of post hoc analyses.

First, we re-estimated our models using an alternative measure for knowledge multiplexity index. In particular, we created a 7-point scale measure for knowledge multiplexity, calculated as the average of the three knowledge acquisition items. The results were consistent with those reported in the paper. Second, following Sammarra and Biggiero (2008), we explore the existence of differences regarding the relationship between trust and each different type of knowledge acquired. We performed three separate regression analyses using the acquisition of each type of knowledge (measured on the 7-point scale) as dependent variables, trust as independent variable, and controlling for the same variables as in the multiplexity model. In all of the three models corresponding to each type of knowledge acquired, trust has a positive and significant relationship with knowledge acquisition.

To summarize, the post hoc analyses performed reinforce our findings and indicate that trust plays a significant role not only in developing knowledge multiplexity within the relationship, but also in the acquisition of all three types of knowledge separately. The results of these analyses are available from the authors upon request.

Discussion and Conclusions

A core premise in the SME literature is that SMEs face stronger resource constraints than large firms (Colombo et al. 2012; Moreno and Casillas 2008). External knowledge access and mobilization are thus regarded as particularly important in the SME setting (Coombs, Mudambi, and Deeds 2006; Rothaermel and Deeds 2004). At the same time, however, surprisingly little research addresses SMEs' knowledge acquisition and transfer in the interorganizational context (Street and Cameron 2007; Thorpe et al. 2005). Street and Cameron (2007) conduct an extensive review of the literature on SMEs' relationships with external partners and conclude that "organizational learning and knowledge transfer (...) are discussed, but very briefly, and are

Table 1
Correlations, Mean and Standard Deviations

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Firm age	13.126	12.233	-								
2. Firm size	64.262	61.808	0.054	-							
3. Duration of the relationship	8.369	7.999	0.281**	0.071	-						
4. Client	0.640	0.481	0.084	-0.039	0.041	-					
5. Supplier	0.373	0.485	0.010	0.007	0.044	-0.570**	-				
6. Distributor	0.113	0.318	-0.124	-0.045	-0.122	-0.301**	-0.189*	-			
7. Knowledge-based resources	5.219	1.175	-0.134	0.084	-0.034	-0.092	0.022	0.094	-		
8. Trust	5.502	1.060	-0.084	-0.004	-0.019	0.044	-0.002	0.009	0.210*	-	
9. Interpartner dissimilarity	1.346	0.759	0.113	-0.060	0.060	0.087	-0.080	-0.108	-0.148	-0.210*	-
10. Knowledge acquisition	1.900	1.079	-0.084	-0.020	0.095	0.008	0.021	-0.065	0.305**	0.403**	-0.236**

* $p < .05$

** $p < .01$

Table 2
Results of the Regression for Acquisition of Multiplex Knowledge

	Model I		Model II (b)		Model III	
	Stand. β	<i>t</i>	Stand. β	<i>t</i>	Stand. β	<i>t</i>
Control variables						
Firm age	-0.101	-1.165	-0.093	-1.161	-0.081	-1.023
Firm size	-0.071	-0.858	-0.082	-1.070	-0.087	-1.163
Duration of the relationship	0.143†	1.673	0.164*	2.067	0.123	1.544
Client	0.049	0.434	0.012	0.110	0.025	0.243
Supplier	-0.002	-0.021	-0.054	-0.531	-0.040	-0.395
Distributor	-0.072	-0.751	-0.099	-1.100	-0.104	-1.182
Knowledge-based resources	0.352***	4.247	0.228**	2.856	0.240**	3.051
Independent variables						
Trust			0.343***	4.335	0.379***	4.792
Interpartner diversity			-0.159*	-2.000	-0.141†	-1.808
T x ID					-0.188*	-2.403
Model						
R^2	0.155		0.299		0.330	
Adjusted R^2	0.109		0.247		0.275	
<i>F</i>	3.358**		5.816***		6.015***	

† $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

relatively underdeveloped topics” (Street and Cameron 2007, p. 251). Our study contributes to the literature on SMEs’ external knowledge acquisition by illuminating the conditions under which SMEs concurrently acquire multiple types of knowledge from key commercial partners.

A first key insight from our study concerns the role of trust as a driver of knowledge multiplexity in SMEs’ relationships with their commercial partners. Whereas there is an impressive amount of research on trust and knowledge acquisition in interorganizational settings, evidence on the issue is mixed. Some studies propose a positive relationship (for example, Hausler, Hohn, and Lutz 1994; McEvily, Perrone, and Zaheer 2003), whereas others indicate that the relationship might be negative (Yli-Renko, Autio, and Sapienza 2001). Focusing on SMEs’ relationships with their main clients, Yli-Renko, Autio, and Sapienza (2001) report that trust inhibits knowledge acquisition. The underlying logic here is that trust might turn negative

because of an overembeddedness trap that locks the firm into the relationship and prevents it from exploring knowledge within new ties (Uzzi 1997). Moreover, as trust increases, the necessity to monitor and bargain decreases, reducing the firm’s alertness to new information and the intensity of information-processing efforts (Szulanski, Cappetta, and Jensen 2004; Yli-Renko, Autio, and Sapienza 2001). Combined with this evidence, our findings suggest that the effects of trust could vary depending on the breadth of the knowledge to be exchanged and acquired between the partners. Like Lowik et al. (2012), our findings indicate that multiplexity can eliminate the risk of overembeddedness. Whereas trust might not be beneficial when the scope of knowledge acquisition is narrow, trust provides partners with the motivation and opportunity (Argote, McEvily, and Reagans 2003) needed to exchange multiple types of knowledge concurrently.

Another important observation from our study relates to the effects of interpartner

dissimilarity on the knowledge outcomes of SMEs' relationships with commercial partners. Our results indicate that dissimilarity indirectly reduces the SMEs' ability to engage in knowledge multiplexity by disrupting the positive effects of trust on concurrent exchange of technological, market, and managerial knowledge. Since interpartner dissimilarity implies that partners have unrelated knowledge and thus difficulty understanding each other's knowledge, this result is consistent with previous interorganizational research on knowledge ambiguity (Simonin 1999a, 1999b) and differences in knowledge-processing routines (Lane and Lubatkin 1998). Focusing on the transfer of best practices across organizational units, Szulanski, Cappetta, and Jensen (2004) find that when the ambiguity associated with the organizational practice is high, the positive effects of the source unit's trustworthiness (as perceived by the recipient unit) diminish significantly. Under conditions of ambiguity, the chances that replication is accurate become rather limited, since the recipient unit cannot fully articulate the logic of the practice and might misjudge the need to undertake additional learning efforts (for example direct observation of the source unit). Our study complements this evidence by showing that, in interorganizational settings, trust could increase the transparency of the commercial partner to share valuable knowledge in multiple domains, whereas interpartner dissimilarity could reduce the SME's learning ability.

For a broader theoretical contribution, we turn to the literature on multiplexity. Previous works have approached multiplexity primarily as the extent to which firms develop both social and economic ties within a single relationship (Ferriani, Fonti, and Corrado 2012; Uzzi 1997, 1996; Zerbini and Castaldo 2007). Ferriani, Fonti, and Corrado (2012, p. 26) stress that "more research is needed to understand the role that tie content plays in the emergence of other types of multiplex ties." We extend the notion of knowledge multiplexity (Albrecht and Hall 1991) to the particular setting of SMEs' relationships with key commercial partners. In doing so, we advance the emerging stream of research on the phenomenon of multiplexity in the SME context (Lowik et al. 2012; Sammarra and Biggiero 2008; Uzzi and Gillespie 2002). We complement previous studies by shifting the focus of analysis from organizational-level conditions to the relational conditions of knowledge multiplexity. Lowik et al. (2012) show that trust-based ties with a single partner are an important source of new knowledge when SMEs possess

"bridging" capabilities "to establish multiple relations within a single relationship and to leverage the knowledge from these multiple relations" (Lowik et al. 2012, p. 250). While controlling for organizational-level factors such as the firm's knowledge-based resources, our study reveals the importance and joint effects of trust and dissimilarity on knowledge multiplexity.

Insights provided by our study can inform SME decision making about the search for sources of external knowledge. Based on this study's findings, our first recommendation would be to develop trust-based relationships with key commercial partners. In such a safe context, the partner is likely to be more open to sharing all managerial, market, and technological knowledge. Given the resource restrictions faced by SMEs, this three-in-one option sounds particularly advantageous. Trust may be a necessary but not sufficient condition to enable such an option, however. Acquiring all three types of knowledge is presumably very difficult if the commercial partner follows a completely different strategy, operates in a rather different market, and uses a distant technology. A second recommendation would thus be to perform an explicit diagnosis of the differences (strategic, market, technological) between the SME and the commercial partner. Recognizing the existence of dissimilarities is the first step to dealing with them (Lavie, Haunschild, and Khanna 2012), for example, through the implementation of cultural training programs (Kim and Parkhe 2009). SME managers might then assess whether the advantages of accessing different types of knowledge from the key commercial partner compensate for the costs of bridging such dissimilarities or whether it would be better to find alternative knowledge sources.

As a final reflection, we turn to the study's limitations. First, an important limitation of this study is our use of perceptual measures, which may contain survey respondent biases (Podsakoff and Organ 1986). Self-reported measures provide concept-specific accuracy, whereas objective data allow for replicability and verifiability (Yli-Renko, Autio, and Sapienza 2001). Therefore, future studies would benefit from methodological designs that combine perceptual and objective data. Furthermore, we targeted general managers as the survey respondents in this study. General managers are considered to be particularly knowledgeable informants in SMEs (Kumar, Stern, and Anderson 1993; Lee et al. 2012; Sawang, Parker, and Hine 2016).

Nonetheless, we acknowledge that biases inherent in the use of a single respondent might have affected our results (Podsakoff et al. 2003). For example, the view of the general manager about the level of trust with a key commercial partner might be different from the views of employees/other managers, since their organizational roles might affect their interpretations (Kumar, Stern and Anderson 1993). In this sense, previous research indicates that although trust can develop at different levels within an interorganizational relationship (i.e., between the managers representing the organizations or between each organization and their representatives) and at each level it has unique effects, its influence on resource investments and resource use is similar (Fang et al. 2008). The perceptions of trust can be also different between partnering organizations. Using the perspective of just one partner to evaluate the level of interorganizational trust represents a common limitation of trust studies (Anderson, Zerrillo, and Wang 2006). However, previous evidence in commercial settings like buyer-supplier relationships indicates that partners overall have consistent perceptions of their exchange relationships (Anderson and Narus 1990; Poppo, Zhou, and Ryu 2008, p. 45; Zaher, McEvily, and Perrone 1998). Nonetheless, future research combining information from multiple informants might yield additional insights on the relationship between trust and knowledge multiplexity. We also encourage future studies to adopt dissimilarity measures that separate differences in partners' routines (for example Lavie, Haunschild, and Khanna 2012) from other more cognitive differences such as goal incongruence (for example Kim and Parkhe 2009). Examining the interactions of these two dissimilarity dimensions represents a promising avenue for future research.

Second, focusing on a sample of Spanish SMEs in a single industry eliminates country and industry variation effects, yet the generalizability of our results to other settings could be limited. For example, our results indicate that firms will not increase the scope of knowledge exchange unless they feel that the partner will not act opportunistically, since knowledge is the most strategically-significant resource (Grant 1996), especially in knowledge-intensive industries such as ICT (Gaur et al. 2011). This might not be the case, however, in more traditional industries. An interesting direction for future research could be to compare the development of knowledge multiplexity across different industries.

Likewise, we acknowledge that some industry characteristics such as concentration and rivalry might vary across countries. The impact of trust on knowledge multiplexity might be also affected by such country-specific characteristics of the industry. For example, in very hostile environments, SMEs should allocate significant attention to monitoring and reacting to competitors' actions. While SMEs are focusing their attention on dealing with rivals, they might be less able to undertake other strategic actions (Ocasio 1997), including those necessary to acquire multiplex knowledge from commercial partners. To account for these potential effects, we encourage future studies to explore the development of knowledge multiplexity in cross-country settings.

Finally, despite the cross-sectional nature of our analysis, we acknowledge that interorganizational knowledge transfer and acquisition occur over time as partners accumulate mutual interactions (Dyer and Singh 1998). As trust is also a dynamic phenomenon (Zaheer, McEvily, and Perrone 1998), interpartner dissimilarity might be altered as partners learn about each other (Parkhe 1991). Future longitudinal analyses would therefore provide richer insights into the joint effects of trust and dissimilarity on multiplex knowledge acquisition. Furthermore, because our study focuses on knowledge multiplexity, we emphasize the concurrent, acquisition of technological, market, and managerial knowledge (rather than differences between these three types of knowledge). However, even we found indications that the effect of trust does not differ for the acquisition of the three types of knowledge analyzed, previous studies indicate that these types of knowledge are unevenly distributed and might be exchanged to different degrees (see Sammarra and Biggiero 2008). Examining more in deep these differences, while beyond the scope of this study, is an interesting direction for future research.

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Appendix: Measures

Variable	Items
Knowledge-based resources	<p>Compared to other companies in your industry, does your company have a strong or weak position in terms of:</p> <p>Staff with a positive commitment to the company’s development</p> <p>Technical expertise</p> <p>Expertise regarding development of products and services</p> <p>Highly productive staff</p> <p>Expertise in marketing</p>
Trust	<p>We can understand each other well and quickly.</p> <p>In this relation, both sides are expected not to make demands that can seriously damage the interests of the other.</p> <p>In this relation, the strongest side is expected not to pursue its interest at all costs.</p> <p>In this relation, informal agreements have the same significance as formal contracts.</p> <p>Both sides know the weaknesses of the other and do not take advantage of them.</p>
Interpartner dissimilarity	<p>This partner has similar technological competencies.</p> <p>This partner serves similar markets.</p> <p>This partner follows similar competitive strategies</p>
Acquisition of multiplex knowledge	<p>Through the relationship with this firm, we access more knowledge about the market.</p> <p>Through the relationship with this firm, we obtain technological knowledge and important know-how.</p> <p>Through the relationship with this firm, we obtain knowledge useful for the management of our firm.</p>