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The Role of Cluster Intermediaries for KIBS' Resources and Innovation

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Knowledge-intensive business services (KIBS) help manufacturing firms boost their innovation activities, yet the question of which kinds of resources and intermediaries KIBS need for their own innovation activities remains largely unstudied. The current article investigates whether clustered KIBS might need an intermediary to access innovation resources, by studying the effects of network administrative organizations (NAOs) on KIBS' resources for innovation. Using a survey of 53 KIBS in a French cluster, the authors find that NAOs directly affect both KIBS' internal and external resources for innovation. They also study the intermediary effect of NAOs on KIBS' absorptive capacity and provide recommendations for public policy to boost clustered KIBS' innovation intensity.

Introduction

In advanced economies, knowledge emerges as the most important source of competitive advantage for firms (Smedlund and Toivonen 2007). In service sectors, knowledge largely defines employment and value (Gallouj 2002; Gallouj and Windrum 2009; Tether 2005; Tether and Hipp 2002). Although knowledge-intensive service activities traditionally were conducted in-house, because of their strategic importance and firm-specific nature, modern firms increasingly are outsourcing these activities to take advantage of economies of scale and scope (OECD 2007). Knowledge-intensive business services (KIBS) attract special interest (Carmona-Lavado, Cuevas-Rodríguez, and Cabello-Medina 2013), considering their role in providing nonmaterial, intangible, customized services—such as IT, accounting, management consulting, advertising, market research, engineering, and technical services—to satisfy the needs of other companies and organizations through the creation, accumulation, or dissemination of knowledge (Koch and Strotmann 2008; Smedlund and Toivonen 2007).

Most research on KIBS thus has focused on their intermediary role and studied them as bridging actors that provide knowledge for firms' innovation. Yet limited research attention centers on innovation by KIBS (He and Wong 2009) and on whether they could also benefit from intermediaries to foster their own innovation activities. Nor has sufficient research addressed KIBS' innovation in association with cluster membership (Corrocher, Cusmano, and Morrison 2009), even though firms located in clusters benefit from support from intermediaries, such as complementary agents (Waxell 2009), local authorities (von Malmborg 2004), or network administrative organizations (NAOs; Provan and Kenis 2008). Our research, anchored in the knowledge-based view, extends research into the antecedents of KIBS' innovation by addressing specifically the role of NAOs

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as cluster innovation intermediaries. In so doing, we attempt to address a question that has remained unanswered, despite widespread acknowledgment of the importance of KIBS for open inbound innovation (Spithoven, Clarysse, and Knockaert 2010): Do KIBS need intermediaries to increase their resources and innovation?

In this study, we analyze the influences of not only internal and external resources on KIBS' innovation but also NAOs as cluster innovation intermediaries on KIBS' innovation resources. Our empirical study relies on a representative sample of 53 KIBS from the Savoie Technolac cluster, located in the French Rhone-Alps region. Structural equation modeling confirms a direct role of NAOs for improving KIBS' internal and external resources. The results also show the intermediary effect of NAOs, which improves their ability to acquire external sources (i.e., absorptive capacity) and increases their innovation intensity. The present study thus fills a void in KIBS and cluster management literature by showing that KIBS can benefit from assistance by innovation intermediaries (NAOs); that is, cluster intermediaries and KIBS may play complementary roles in clusters.

The next section focuses on resources for KIBS' innovation, including the possible influence of cluster intermediaries and NAOs. After we elaborate on the hypotheses and theoretical framework, we present our methodology and data. A partial least squares model leads to the results of a quantitative study of KIBS located in the Savoie Technolac cluster. This study concludes with theoretical and public policy implications, limitations, and avenues for research.

KIBS as Innovators

Despite some key differences,[1] KIBS share three common characteristics (Miles et al. 1995). First, they rely heavily on professional knowledge and develop a high level of expertise related to a specific (technical) discipline or (technical) functional domain (den Hertog 2000). Second, they are primary sources of knowledge or else knowledge to produce intermediate value-added services for their clients' production processes. Third, they are of competitive importance and primarily supply other businesses. Accordingly, KIBS are critical to innovation systems and clusters in knowledge-based economies (He and Wong 2009; Muller and Zenker 2001), because service providers are integral components of clusters, acting as bridging agents that connect knowledge sources and innovators (den Hertog 2000; Miles 2007; Muller and Zenker 2001). Wong and He (2005: 2) support the idea in stating that "KIBS provides a platform to study group of services which is very actively integrated into innovation systems by joint knowledge development with their clients, and which consequently create considerable positive networks externalities and possibly accelerate knowledge intensification across economy." By combining knowledge from different sources, coproducing knowledge with clients, and spreading knowledge to new clients (Muller and Zenker 2001; Smedlund and Toivonen 2007), KIBS have both direct and indirect impacts on innovation activities, paving the way for the absorption of knowledge from other sources. In this sense, KIBS play dual roles, as both sources of and bridges for innovation (Yam et al. 2011). Finally, as providers of knowledge-intensive inputs for other organizations and innovation intermediaries (Dodgson and Bessant 1996; Rothwell and Dodgson 1991), KIBS tend to be highly innovative.

Most studies thus emphasize the role of KIBS firms as innovation agents, intermediaries, or facilitators of knowledge transfer and diffusion in innovation systems. Empirical studies also focus on KIBS' contributions to the innovation capacity of their clients (e.g., den Hertog 2000) or their greater innovation intensity compared with other service and manufacturing firms (Tether and Hipp 2002; Wong and He 2005). Theoretical analyses also consider interactions by KIBS as innovation facilitators or innovators (Gallouj 2002; Strambach 2001). Despite this increasing attention to service innovation though (den Hertog 2000; den Hertog, Van der Aa, and De Jong 2010; Gallouj and Weinstein 1997), empirical research on KIBS' innovation contains little recognition of antecedents (Amara, Landry, and Doloreux 2009; Corrocher, Cusmano, and Morrison 2009; Freel 2006; Koch and Strotmann 2008). Empirical studies in the

[1]Miles (2005) distinguishes two basic types of KIBS: traditional professional services, which draw mainly on knowledge of administrative and other institutional systems, and new technology-based services, which focus more on technological knowledge. As we discuss subsequently, other classifications suggest more diverse, specific types of KIBS.

service sector address the distinct roles and innovation practices of traditional versus knowledge-intensive services (Freel 2006; Tether 2005), revealing that KIBS firms assign more importance to innovation than do their non-KIBS peers (Ferreira, Raposo, and Fernandes 2013). In describing various innovation modes, Corrocher, Cusmano, and Morrison (2009) highlight four KIBS profiles: interactive, product, conservative, and techno-organizational. Amara, Landry, and Doloreux (2009) instead examine the determinants of six innovation forms (technological product, technological process, organizational delivery, strategy, managerial, and marketing). Thus, KIBS are diverse (cf., Miles 2007). Doloreux and Shearmur (2010) compare innovation patterns across different KIBS and find clear differences in their innovation profiles, depending on their sectors of activity (which induce varying degrees of innovation intensity).

Our study instead represents a unique examination of the role of innovation intermediaries on the resources available for KIBS' innovation. We bridge two strands of innovation literature, pertaining to the antecedents of KIBS innovation and to intermediaries, using a theoretical framework that we derive from the resource-based view and that focuses on knowledge aspects obtained through resources, which are key for KIBS. This knowledge-based view (KBV) suggests that a primary firm function is to create, integrate, and apply knowledge (e.g., Grant 1996; Nonaka et al. 2006). Therefore, innovation is based on new knowledge development and acquisition processes. Related literature also suggests that sources of knowledge consist of internal and external aspects, such that firms might balance their internal and external learning (Zack 2003). In such scenarios, firms try to seek complementarities between activities designed to create internal knowledge and those aimed at assimilating external knowledge (Camison and Villar-Lopez, 2012; Zahra and George 2002).

In line with the KBV, the knowledge-based view of clusters (Bahlmann and Huysman 2008; Maskell 2001) highlights how intermediaries in clusters can improve members' resources and innovation. To link organizations within an innovation system, intermediaries often focus on technology transfer, the commercialization of ideas, and funding (Inkinen and Suorsa 2010). These organizations aim to support innovation creation, dissemination, and collaboration. Several studies also approach innovation mediation through the particular functions of the intermediaries (Howells 2006). Our study falls within this tradition.

Specifically, we analyze KIBS' internal and external resources and their link (i.e., absorptive capacity), as well as the impacts of intermediaries on this link. Prior studies do not acknowledge how external facilitators, such as innovation intermediary organizations, might help small firms access resources. We bridge this gap by investigating a specific type of small and medium-sized enterprise (SME), namely, small KIBS. We also consider a rarely addressed feature of these firms: their own innovation performance (rather than their function as innovation intermediaries). Research on the determinants of KIBS' innovation asserts that, similar to manufacturing firms, they need internal and external sources. The development of explicit knowledge strategies by KIBS enhances their innovation capabilities, leading Amara et al. (2010) to suggest that studies of KIBS should pay more attention to the strategies they devise to develop their knowledge resources. He and Wong (2009) also argue that knowledge interactions with manufacturing clients increase KIBS' innovation, and Carmona-Lavado, Cuevas-Rodríguez, and Cabello-Medina (2013) posit that the positive effect of human capital on service innovativeness is moderated by collaboration intensity with clients. To the best of our knowledge, though, no research has examined the impacts of internal and external resources on (small) KIBS' innovation intensity. The analysis of whether KIBS, which are themselves innovation intermediaries, also need innovation intermediaries to boost their resources fills a research void. This question appears especially crucial for small KIBS, because they likely behave similarly to their manufacturing SME counterparts, which need such innovation help.

In short, little systematic empirical research investigates the major factors that influence the innovation behavior of KIBS firms. Factors influencing innovation capabilities include employees, firm strategies, network resources, government support (Amara et al. 2010), and even trademarks (Gotsch and Hipp 2012). Innovation in (knowledge-intensive) services appears dominated by autonomous rather than client-led ideas (den Hertog, Broersma, and van Ark 2003), with a prominent role for new technology. Some insights from research on innovation in manufacturing apply (Gallouj and Windrum 2009; Tether 2005). For example, innovations depend on interactive processes among firms and various external organizations. Few firms can innovate in isolation, so most of them complement their ability to create knowledge in-house by exploiting knowledge from external sources. Both internal and external resources thus are important for enhancing innovative performance (Caloghirou, Kastelli, and Tsakanikas 2004).

Internal Resources

As service industries that rely heavily on knowledge (Amara et al. 2010; Miles et al. 1995), KIBS use existing professional knowledge or produce new knowledge to help clients solve problems (Freel 2006; Tether 2005). Some studies indicate that service firms undertake less R&D than manufacturing firms (e.g., Tether 2005), but Koch and Strotmann (2008) show that R&D inputs exert significant positive impacts on the probability of producing radical innovations. By definition, professional knowledge is critical to KIBS (den Hertog 2000; Miles et al. 1995), and a significant portion of their knowledge resources is controlled by individual professionals who represent critical sources of knowledge and competence (Leiponen 2005). Therefore, in addition to R&D expenditures, we consider qualified personnel as an internal source of knowledge, necessary for innovation (Caloghirou, Kastelli, and Tsakanikas 2004). Together with engaging in internal R&D activities, training represents the most distinctive innovation activity undertaken by KIBS (Hipp et al. 2015). Expert skills enable KIBS to provide competitive services; highly qualified staff tends to achieve greater innovativeness (Freel 2006). Moreover, knowledge input relates positively to KIBS' innovation performance (Tseng, Pai, and Hung 2011). In line with the KBV framework and prior findings, we retain two main types of internal resources, based on knowledge creation and assimilation, for KIBS' innovation: internal R&D and dedicated actors to innovation, who are professionals with critical knowledge resources. We thus posit:

H1: KIBS' internal resources have positive relationships with their innovation.

External Resources

Interactions with external sources of knowledge provide missing inputs in learning processes (Romijn and Albaladejo 2002). Firms can reinforce their innovation capabilities by acquiring technologies and then diffusing, assimilating, communicating, and absorbing them into their organizations (Cohen and Levinthal 1990). The firm's ability to acquire, use, and develop valuable resources and capabilities relates to its acquisition of external knowledge and ability to integrate that knowledge with its own knowledge base (Teece 2007). Two types of firm efforts can help establish knowledge flows and linkages (Souitaris 2001): (1) scanning external information (e.g., technical reports, patent databases, conferences, scientific publications) and (2) cooperating with external organizations (e.g., research institutions, universities, consultants). In the first category, we concentrate on patents, because the use of patent databases can provide valuable knowledge about potentially profitable research areas or ways to invent around a patent (Arundel 2001). Patents also reflect the interplay between basic/applied scientific research and technological development in corporate R&D efforts.

Souitaris (2001) and Koch and Strotmann (2008) highlight the importance of access to knowledge from universities, such that universities constitute key innovation sources for service firms (Janeiro, Proença, and Da Conceicäo Gonçalves 2013). Firms located in clusters (e.g., technopoles, science parks) are significantly more likely to have links to local universities than are off-park firms (Löfsten and Lindelöf 2002). Such "constellation" firms are more willing to seek information from outside sources, such as higher education institutes, consultants, and community entrepreneurs, than are other firms (Lorenzoni and Ornati 1988). Generally speaking, an increase in such network resources thus should boost KIBS' innovation capabilities (Amara et al. 2010). Previous research sheds light on the sources of these positive externalities. Informal knowledge exchange (Dahl and Pedersen, 2004) through personal contact is a significant lever of knowledge diffusion in clusters. However, prior literature includes only collaborations with business partners (Carmona-Lavado et al. 2013), but we seek to extend these insights by investigating three sources of external resources and knowledge that might increase innovation intensity: patent acquisition, cooperation with universities, and cooperation with consultants. In line with the KBV literature and the importance of external flows of knowledge for KIBS' innovation, we investigate two notable providers of external knowledge resources: collaboration with universities, experts, or consultants and acquisition of patents. We posit that these external resources affect KIBS' innovation:

H2: KIBS' external resources have positive relationships with their innovation.

Although we thus test the impact of both internal and external resources on KIBS' innovation, our main objective remains to assess the influence of intermediaries (NAOs) on KIBS' resources and innovation.

Innovation Intermediaries and NAOs in Clusters

Clusters (a generic term for science and technology parks) serve three main purposes: reindustrialization, regional development, and the creation of synergies or "innovative milieux" (Castells and Hall 1994). Considerable resources have been devoted to establishing science parks as policy instruments to promote research-based industrial and innovative activity (Löfsten and Lindelöf 2002). Science parks are crucial to new firm formation, as well as to existing firms' survival and development. Most definitions of these parks mention knowledge transfer from universities and R&D institutions, as well as the creation of new firms that can commercialize new technologies, as central goals (Ratinho and Henriques 2010). Yet most studies ignore intra-park relationships, even though such links are crucial for understanding how proximity might promote innovation (Phillimore 1999).

As intermediaries, KIBS have important roles in national and regional innovation systems, technopoles, and clusters (Howells 2006), but they are not the only important actors. Although cluster theory originally developed in support of the view that concentration causes firms' innovation and economic growth, the KBV of clusters instead predicts that concentration and proximity alone cannot explain such performance (e.g., Boschma 2005; Torre and Rallet 2005). Thus, cluster effects do not necessarily arise because common knowledge becomes available to cluster members, whether it is consciously communicated or not. In contrast with Marshallian or Porterian views, the KBV of clusters asserts that firms are not the only important actors and that local synergy can and should be enhanced through the creation of local "agents of animation" or cross-firm organizers (Maskell 2001). Waxell (2009) emphasizes that formal institutions, such as regional industry or trade organizations, enable collaboration across various cluster members by bringing public sector funding opportunities to businesses. Our argument is that intracluster links need to be investigated, not only among firms but also between formal institutions such as NAOs and firms.

In a cluster, geographic proximity complements other forms, such as social, organizational, institutional, and cognitive proximity (Boschma 2005), which in turn is key to the member firms' performance, because it relates positively to the number of in-cluster ties (Li, Velivath, and Tan 2013). In that sense, intermediaries might help increase cluster ties, especially for SMEs that lack sufficient resources for this type of networking activity. However, in policy-driven clusters, intermediaries may struggle to create an environment that is conducive to the rich networking that takes place in that context (Richardson, Yamin, and Sinkovics 2012). Nevertheless, a recent case study (Parker and Hine 2014) suggests that the role of knowledge intermediaries is greater than "just" facilitating interactions; knowledge intermediation affects firms' ability to learn and absorb knowledge from their environment.

French clusters (known as "competitiveness poles" or technopoles) are required to have a dedicated structure in charge of their orientation and animation. This formal, centralized structure commonly appears in the form of an NAO, a dedicated, separate administrative entity that exists solely to govern the cluster network and its innovation activities (Provan and Kenis 2008). Brokering involves more than linking; it also aids in the transformation of transferred ideas and knowledge (Hargadon and Sutton 1997). The broker acts as a link and a repository of knowledge that benefits clients directly. These third parties are necessary to build absorptive capacity and organize inbound open innovation (Spithoven, Clarysse, and Knockaert 2010). Collective technical institutions can help firms scan the market for technologies, develop abilities to absorb the acquired technology and knowledge, and perform complementary R&D. Intermediary services provide a complement (rather than substitute) to manufacturing firms' internal technology transfer management activities (Lichtenthaler 2013). That is, firms need sufficient internal capabilities to manage technology transfers. Several studies cite the important role of intermediaries in clusters, in terms of fostering small firms' innovation (e.g., Bocquet and Mothe 2010; Pillania 2008; Spithoven et al. 2010). The existence of cluster governance structures (or NAOs) departs from theories of network governance though (Jones, Hesterly, and Borgatti 1997), which assume that governance in networks is dispersed across parties and functions as an informal process among cluster members. Yet cluster governance also can take a more centralized form, as is the case in French clusters. The role of the NAO generally is filled by local intermediaries that concentrate on promoting networking among actors (Inkinen and Suorsa 2010). However, not all organizations in the cluster have the same ability or willingness to interact with local institutions (Molina-Morales and Martínez-Fernández 2010). Accordingly, some recent qualitative studies identify the NAO as an intermediary that can foster innovation (Bocquet and Mothe 2010; Hine, Parker, and Ireland 2010; Waxell 2009). Quantitative studies show that firm involvement in local institutions is positively associated with innovation (Molina-Morales and Martínez-Fernández 2010). Therefore, we hypothesize that a cluster intermediary, such as an NAO, can help KIBS develop both their internal and external resources and knowledge for innovation.

To define more precisely which types of resources and knowledge an NAO can bring to KIBS, we turn to the KBV, according to which a cluster is "a well-designed engine for information processing, but more importantly, it assiduously becomes a context in which knowledge—the engine's fuel—is created" (Nonaka et al. 2006, 1186). Various obstacles and the complexity of the process mean that localized knowledge interactions among players cannot be spontaneous, so the challenge for the NAO is twofold (Howells, 2006; Lynn et al., 1996; Stankiewicz, 1995). First, it needs to provide collective goods to facilitate the flow of knowledge among cluster members. Second, it must link players within the innovation system. We retain these two aspects of NAO intermediation and posit:

H3: NAOs have positive effects on KIBS' (a) internal and (b) external resources.

In addition to this direct effect, we test for a potential indirect (intermediary) effect of NAOs, such that they might enhance KIBS' absorptive capacity. Greater absorptive capacity fosters recognition of the value, assimilation, and application of external knowledge (Cohen and Levinthal 1990). Liao, Fei, and Chen (2007) find that absorptive capacity intervenes between knowledge sharing and innovation capability; knowledge sharing has a positive effect on absorptive capacity. Absorptive capacity thus can help an organization integrate external knowledge and transform it into a firm competence. This mediating variable, between knowledge sharing and innovation capability, acts as a bridge (Muller and Zenker 2001). If absorptive capacity is inadequate, knowledge sharing in a firm offers fewer direct benefits for the firm's innovation capability. Koch and Strotmann (2008) confirm the importance of absorptive capacity and the pivotal role of access to knowledge from external partners in innovation. Particularly for radical innovation, access to formal knowledge is important. Knowledge absorptive capacity relates positively to innovation performance (Tseng et al. 2011). We accordingly predict that NAOs are important as means to help firms take advantage of their internal and external resources, through the development of their absorptive capacity:

H4: NAOs positively affect KIBS' absorptive capacity (i.e., relationship between internal and external resources).

Figure 1 represents our theoretical model.

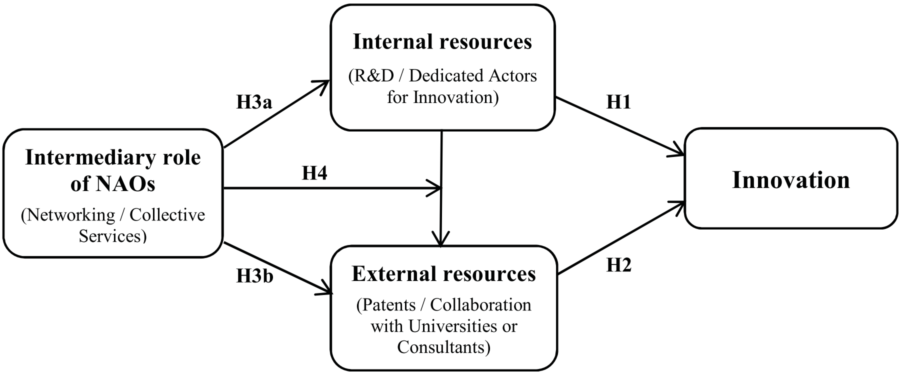
Data and Methodology

Research Setting

The Savoie Technolac cluster follows a Silicon Valley model. Local political and economic motivations led to the development of a new site for university, research, and high-technology services. The cluster contains a large proportion (almost 70 percent) of independent, very small firms with fewer than 10 employees (Appendix 1). Savoie Technolac's NAO consists of a joint syndicate of local public authorities that prefers that local public institutions remain independent of regional or national public policies. With the cluster's creation in 1987, the local institutions decided to establish a permanent executive team to take charge of managing and developing the cluster. This team comprises "twelve members who work closely with a network of distinct partners to serve the best interests of the territory."[2]

[2]See http://www.savoie-technolac.com/125-equipe.htm.

Figure 1
Theoretical Model



The partners possess complementary expertise, such as innovation and technological transfer, financing, industrial and intellectual property, internationalization, and economic development skills. A CEO is in charge of the overall strategy. The team also features an administrative director and fulfills three missions:

(1) Develop collaborations with on- or off-site partners for innovation, at the direct, individual level for cluster firms.
(2) Create a wide range of services to foster indirect networking among local firms, such as conferences, business clubs, expert presentations, and breakfasts.
(3) Encourage industry–research cooperation through enhanced direct or indirect networking incentives, to increase technology transfer opportunities.

Savoie Technolac's strategic initiatives seek to build innovation networks at the local and global levels. In addition to participating in an innovation network dedicated to French clusters and incubators, the cluster engages with two other "competitiveness clusters" in the Rhône-Alpes region: *Tenerrdis*, dedicated to renewable energies, and *Plastipolis*, specializing in plastics and composites. Finally, Savoie Technolac has links with international science parks, such as the Metropolitan Technopark (Quebec) and Techno Park (Montreal).

Data Collection

This study, conducted in June 2009, is based on a survey of 88 KIBS firms located in the cluster. Internet questionnaires[3] were sent to all KIBS' CEOs, along with two follow-up messages, which prompted 53 valid questionnaires, or a 62 percent response rate.[4] This high response rate reflects the institutional support provided by the Savoie Technolac NAO, which conducted follow-up telephone calls. The sample also is representative of the population, in terms of subsector affiliation and size. In particular, all firms operated in KIBS, but most engaged in technology-oriented KIBS, such as computer/IT services (13 firms, 24.5 percent) or engineering (18 firms, 34 percent). The descriptive statistics are in Appendix 1. Because the data collection process could induce common method and nonresponse biases, we combined both statistical [Harman's one-factor test; Whitehead, Groothuis, and Blomquist's (1993) nonresponse test] and procedural pretested survey (Podsakoff and MacKenzie 2003; Tourangeau, Rips, and Rasinski 2000) approaches to reduce any such concerns.[5]

[3]This questionnaire sought to measure innovation performance and determinants for small firms in Savoie Technolac; most of questions matched those used in Community Innovation Surveys.

[4]We have an exhaustive sample, where $n\,(53) > 1/7\,N\,(88)$. At the $1 - \alpha = 0.95$ level, the maximum error is 8.5 percent.

[5]The detailed results of these tests are available on request.

Method

This section presents the methodological approach, the variables and their latent constructs, and the empirical validation. The data analysis was conducted using partial least squares (PLS), a structural model technique that is well suited to assess predictive relationships in analyses designed to build theory (Wold 1985). Because PLS can model latent constructs, even in conditions of non-normality, it is particularly well adapted to smaller samples (Chin, Marcolin, and Newsted 1996). The PLS analysis consists of two steps: validate the relevance of the latent construct from theoretical literature (Table 1), and then evaluate the explanatory and predictive dimensions of the structural model.

Variables

Similar to the Oslo Manual and Community Innovation Surveys, our approach identifies innovating firms and uses indirect proxies to measure their innovation activity (Archibughi and Pianta 1996; Mairesse and Mohnen 2010). The 2009 data collection focused on the firm level.

The dependent variable captures the degree or intensity of innovation. Intensity of innovation reflects the magnitude of change or degree of innovation novelty (Gatignon et al. 2002; Tidd, Bessant, and Pavitt 1999), on a continuum from incremental to radical (Green, Gavin, and Aiman-Smith 1995). In Garcia and Calantone's (2002) classification, innovations are incremental when marked by slight improvements that use existing technologies and target existing markets. Really new innovations result in either market or technology discontinuities but not both, such as new technologies for existing markets or existing technologies for new markets; and radical innovations imply discontinuities in both the existing market and technology structures. On a three-point scale for measuring product/service innovation intensity (*Intensity_inno*), respondents indicated whether their firm introduced an innovation in the three years preceding the survey (2006–2008) and the degree of novelty of the innovation (i.e., improve existing product, new for the firm but not for the market, new to the firm and the market). Although these perceptions might entail some bias, participants' views offer the best measure; patent data cannot objectively reflect innovation by KIBS or small firms (Romijn and Albaladejo 2002).

The independent variables come from prior literature. First, R&D (*Internal_R&D*) should foster radical innovation by KIBS (Koch and Strotmann 2008), though such a single, static proxy cannot provide an accurate operationalization of absorptive capacity (Flatten et al. 2011; Miles 2007). Therefore, in line with literature that acknowledges the importance of internal expertise and professional knowledge (den Hertog, 2000; Miles et al., 1995), we account for the presence of competent internal staff dedicated to innovation activities (*Dedicated_actor_Inno*). A reflective variable (*Intern_resources*) consists of two items, *Internal_R&D* and *Dedicated_actor_Inno*. Second, in line with the three main sources of external knowledge acquisition, as highlighted by Souitaris (2001), we use a composite variable (*Extern_resources*) that includes collaborations with universities (*Collab_Univ*), collaborations with experts and consultants in the field of innovation (*Consultant_Inno*), and the acquisition of patents (*Patent_ext*). Third, a latent variable captures the intermediary role of the NAO in supporting KIBS' innovation (*Intermediary_role*). Innovation intermediaries not only provide immediate, "one-off" intermediary services to their clients but also seek to offer longer term, "relational" innovation capabilities (Howells, 2006). Therefore, in line with Stankiewicz (1995), Lynn et al. (1996), and Howells (2006), for this study, the intermediary role entails two actions: (1) providing collective services to facilitate the flow of knowledge to local firms (*Services_ST*) and (2) helping firms to network and meet partners for their innovation activities (*ST_relations*).

The model also includes some control variables. Because the effect of firm size on innovation intensity remains unclear (Chandy and Tellis 2000), and most firms in our sample are small, a four-point scale controlled for a size effect (1–4 full-time employees, 5–9, 10–49, or more than 50 employees). As mentioned, the cluster has a strong technological orientation, so our sample is composed of many firms from engineering sectors (NACE codes from 70 to 78, see Appendix 1). To avoid sector effects, we created a dummy variable (*Ing_sector*) to control for the potential sector-related biasing effect on our results.

Validation of Latent Constructs

The use of latent constructs for structural equation modeling requires prior consideration of convergent and divergent validity through a confirmatory factor analysis (Gefen and Straub 2005). Convergent validity requires three conditions. First, the items that measure a latent

Table 1
Variable Definitions

Independent Variables	Items	Measures
Networking activity *(Intermediary_role)* (Lynn et al. 1996)	1. During the last three years, did the Savoie Technolac team put you in relation with some innovation partners? (ST_relation)	Four-point scale*
	2. During the last three years, did your firm use the networking business services offered by Savoie Technolac (conferences, business clubs, business breakfasts. . .)? (Services_ST)	Four-point scale
	*1. Never; 2. Occasionally; 3. Frequently; 4. Very often	
Internal innovation resources *(Intern_resources)*	1. During the last three years, did your company recruit personnel dedicated to innovation? (Dedicated_actor_Inno)	Binary
(Koch and Strotmann 2008; Miles 2007)	2. During the last three years, did your company engage in internal R&D? (Internal_R&D)	Binary
External innovation resources *(Extern_resources)*	During the last three years, did your company use the following sources to innovate?	
(Souitaris 2001)	1. Collaboration with university (Collab_Univ)	Binary
	2. Collaboration with external consultant (Consultant_Inno)	Binary
	3. Acquisition of patents, licenses, industrial design (Patent_ext)	Binary
Dependent Variable		
Innovation intensity *(Inno_intensity)* (Garcia and Calantone 2002)	During the last three years, did your company introduce innovations that were, on the whole, based on: 1. No innovation 2. Existing ideas in your business that you have improved 3. New for your business but already exist on the market 4. Radically new for your business and your market	Four-point scale
Control Variable		
Ing. Sector *(Ing_sector)*	The value is 1 if sectorial code is related to engineering activities, 0 otherwise.	Binary
Firm size *(Size)*	What was the size of your firm at the end of 2008 (full-time equivalent employees)? 1. <5; 2. 5–9; 3. 10–49; 4. >50	Four-point scale

Table 2
Indicators of Convergent Validity

	Model 1		Model 2	
	AVE	CR	AVE	CR
Extern_resources	0.548	0.783	0.547	0.783
Intern_resources	0.632	0.772	0.637	0.778
Intermediary_role	0.649	0.786	0.648	0.785
Intern_resources × Intermediary_role			0.504	0.674

Notes: AVE = average variance extracted. CR = composite reliability.

variable must achieve a significant value on the axis of that variable (*t*-value > 1.65[6]). Second, all latent constructs must obtain a minimum average variance extracted (AVE) score of 0.5 (Fornell 1987). Third, this second criterion can be consolidated by checking the composite reliability values for each construct (>0.7). As shown in Table 2, the two models exhibit good convergent validity. Regarding the discriminant validity of the latent constructs, two conditions are necessary. All items in the factor loadings matrix of the full model must exceeded the threshold value of 0.5, and each item needs to load higher on its corresponding factorial axis than on other areas. Appendix 2 illustrates the confirmation of discriminant validity for the two PLS models. In addition, if the second condition is met, the square root of the AVE for each construct should be greater than any correlation between that construct and any other construct. The square root of the AVE appears on the diagonal in the correlation matrix (Appendix 3) and offers support for the strong divergent validity of the latent construct in Models 1 and 2.

Results

The results in Table 3 refer to two models. Model 1 tests the direct effects of the conceptual framework (Figure 1) by assessing the role of internal and external resources on KIBS' innovation intensity (H1 and H2), as well as the direct effect of NAOs on internal and external resources (H3). Model 2 adds the indirect effect of NAOs on the relation between internal and external resources (H4).

Model 1: Direct Effects of NAOs and Resources

For KIBS, internal R&D and access to dedicated personnel are essential for absorbing and creating knowledge and enhancing innovation. As expected, both internal (H1) and external (H2) sources of innovation exert significant, positive effects on the degree of innovation ($\beta = 0.24$, $t = 2.03$, $p < .05$; $\beta = 0.32$, $t = 3.34$, $p < .001$, respectively). However, the values suggest that external sources are more important than internal ones for KIBS' intensity of innovation. This first model also indicates a direct, significant, positive impact of NAOs on firms' internal resources ($\beta = 0.42$, $t = 4.93$, $p < .001$) and external resources ($\beta = 0.36$, $t = 3.82$, $p < .001$) (H3). Through active networking activities, the NAO improves internal resources (i.e., internal R&D and dedicated human resources for innovation) and external sources of innovation (i.e., collaboration with universities and consultants and patent acquisitions).

Model 2: Indirect Effects of NAOs on External Resources

Although access to external knowledge drives innovation success, inflows of external knowledge are not automatic or easy (Clausen 2013). That is, external knowledge is "not freely and effortlessly absorbed by the firm" (Fabrizio 2009, 257), so firms located in the same cluster and with the same level of access to external knowledge may not achieve similar results. Liao

[6]These tables are available on request.

Table 3
Results

	Model 1		Model 2	
	β	t	β	t
Internal and external resources of innovation intensity				
Intern_resources → Inno_intensity (H1)	0.24	2.03*	0.23	1.67*
Extern_resources → Inno_intensity (H2)	0.32	3.35***	0.31	2.74**
Moderating role of NAOs				
Intermediary_role → Intern_resources (H3a)	0.42	4.93***	0.41	4.20***
Intermediary_role → Extern_resources (H3b)	0.37	3.82***	0.07	0.85
Intern_resources → Extern_resources			0.57	6.17***
Intermediary_role*Intern_resources → Extern_resources (H4)			0.24	1.65*
Control variables				
Size → Inno_intensity	−0.28	3.25***	−0.29	2.68**
Ing_sector → Inno_intensity	.	0.45	0.06	0.45
R^2 Inno_intensity	0.27		0.27	
R^2 Intern_resources	0.17		0.17	
R^2 Extern_resources	0.13		0.47	

*$p < .05$ (one-tailed test: 1.645, df = 999); **$p < .01$ (2.326, df = 999); ***$p < .001$ (3.090, df = 999).

et al. (2007) indicate that knowledge sharing has a positive effect on absorptive capacity; our results indicate a significant, opposite link, such that absorptive capacity enhances knowledge acquired through external linkages. This effect is manifest in the strong, positive link between internal and external resources ($\beta = 0.57$, $t = 6.17$, $p < .001$). This second model also indicates a direct, significant, positive impact of NAOs on firms' internal resources ($\beta = 0.41$, $t = 4.20$, $p < .001$) but not, in contrast with the first model, on external resources ($\beta = 0.07$, $t = 0.84$, *ns*.). The interaction term of NAO (through active networking activities) and internal resources suggests a positive, indirect role of external sources of innovation ($\beta = 0.24$, $t = 1.65$, $p < .05$). In line with H4, the NAO serves as an intermediary, fostering KIBS' internal resources, and thus their absorptive capacity, which enables them to benefit from external sources of innovation.

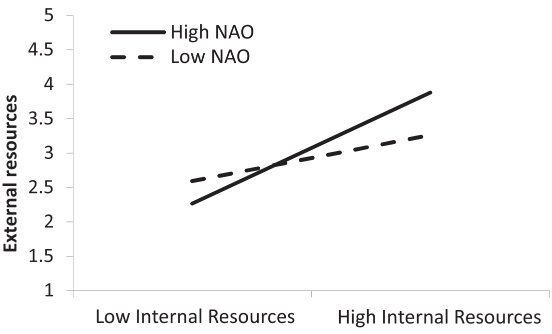
No intrasectoral effects emerge from either model ($\beta = 0.06$, $t = 0.44$, $p < .05$; $\beta = 0.06$, $t = 0.45$, *ns*, respectively). The size of the KIBS determines the intensity of innovation in our sample though ($\beta = -0.29$, $t = 2.49$, $p < .01$; $\beta = -0.29$, $t = 2.68$, $p < .01$, respectively).

Discussion and Conclusions

This first quantitative analysis of the intermediary role of a cluster organization (NAO) on KIBS' innovation provides empirical evidence of its theoretically predicted effectiveness (Provan and Kenis 2008) and thereby reinforces the KBV of clusters. Small KIBS, just as SMEs do, need network-level competencies. This research rests on the assumption that even though KIBS are known for their high absorptive capacity, when they are (very) small, they behave like other SMEs and require innovation intermediaries to bolster their (insufficient) internal resources (Lee et al. 2010).

This study confirms a direct role of NAOs for improving KIBS' internal and external resources; the indirect (intermediary) role of NAO also can strengthen their absorptive capacity for accessing external resources that are crucial for their high intensity innovation. Although small KIBS can introduce innovations independently, intermediaries such as local cluster institutions help increase their internal resources for absorbing new external resources. This finding confirms the role of knowledge intermediaries in developing firm learning capabilities (Parker and Hine 2014). In a further step, we identify how a specific

Figure 2
Simple Slope Test



intermediary, combined with internal resources, can enhance KIBS' absorptive capacity and access to external sources of knowledge. Local institutions such as NAOs have a monitoring role and provide additional strategic resources that help make radical R&D projects more effective. By adopting a global, strategic view of the cluster, the NAO can identify appropriate partners to fill resource gaps. Similarly, Romijn and Albaladejo (2002) show that interactions with scientific institutions increase small firms' innovation performance, though only if the CEOs of these institutions had previous relations with the research labs.

Following Aiken and West (1991), we conducted a complementary simple slope test to clarify the indirect effect of NOAs on external resources. We split internal resources into two groups: a high group (two standard deviations above the mean, solid line) and a low group (two standard deviations below the mean, dashed line), and plotted the estimated relationship between NAOs and external resources (see Figure 2).

When small firms lack previous experience with a scientific institution or external partnerships (low external resources in Figure 2), they must expend too much energy, resources, and time to obtain benefits from the collaboration, especially when the level of support for the NAOs is high. These difficulties relate to attention dynamics (Koput 1997). When there are too many ideas, small firms have trouble and tend to choose the ideas that already are closer to their existing organizational routines (Ocasio 1997). Furthermore, ideas might arrive at the wrong time or in the wrong place, such that firms lack the capacities to value, explore, and exploit them. Because a joint investment in absorptive capacity and openness can be costly and time consuming (Clausen 2013), smaller firms with insufficient resources may be forced to trade off between these activities. As internal resources grow (high internal resources in Figure 2), the NAO offers an important complement to boost firms' resources. In effect, KIBS' needs are similar to those of small manufacturing firms (Spithoven et al. 2010). The importance of collaboration, support, networking, and interactions for KIBS (Hipp et al. 2015) implies the need for policy measures that encourage KIBS in innovation systems, including the promotion of collaborative information schemes, knowledge about emerging opportunities, and loosely coupled collaboration and knowledge-sourcing strategies across regional agencies, science parks, and clusters.

This study thus contributes to the ongoing debate about whether services should be treated like manufacturing when it comes to innovation (Coombs and Miles 2000). In the allocation of intra- and extra-mural R&D expenditures for example, KIBS are more similar to manufacturing than to other service activities (Asikainen 2015). Our findings empirically support a *synthesis* view though: Innovation can take place in manufacturing and in services (Gallouj and Weinstein 1997; Love and Mansury 2007). Similar to manufacturing firms, KIBS' innovation relies on both internal and external sources of knowledge, whereas previous indications suggested that the knowledge-intensive sector would produce mainly client-led service innovations (Bendapudi and Leone 2003). Our findings indicate that most service firms have an autonomous innovation function (den Hertog et al. 2003), so KIBS engaged in R&D and collaborations with universities can benefit from more innovations (Fabrizio 2009). Moreover, they can enhance these mutual benefits when they rely on innovation intermediaries, which increase their absorptive capacity-building activities related to the search for innovation.

More generally, firms can benefit from policies that mimic French clusters, including voluntary, active knowledge creation, and innovation strategies, especially through links with local institutions that serve as intermediaries and that connect small KIBS with actors that are distant—not geographically, but in terms of their organizational and cognitive proximity (Boschma 2005; Li et al. 2013). Yet French clusters also are specific and more than just geographic concentrations. Created by the French government, they are led by an organization that has formal governance rights. Even if a KIBS appears in the cluster's geographic territory, it belongs to the cluster only if it pays a membership fee; in return, it benefits from a series of actions determined by the cluster's governance (NAO), related to innovation, human resources, commercial development, and so on. In this context, NAOs are particularly pertinent, as one possible form of public intermediation. They enhance social proximity among firms, which is critical for achieving collaboration and innovation (Ben Letaifa and Rabeau 2013). By promoting common visions among innovation actors, NAOs help bridge research and innovation spheres in the French system, reflecting the significant changes in France's industrial policy in the past decade. The stereotypical image of French innovation, characterized by a dominant "Colbertist" state, is no longer relevant for public interventions (Mustar and Larédo 2002); the industrial policy also has shifted, from public bureaucracies and centralized government agencies to coordinating mechanisms implemented through clusters and decentralized networks. This "metagovernance" policy (Bell and Park 2006; Parker and Hine 2015) makes NAOs crucial intermediaries that develop networks to facilitate knowledge exchanges between knowledge suppliers and small firms, as well as among the firms themselves. We contribute to research on intermediaries in clusters, without assuming that networking is always dispersed across parties (cf. Jones et al. 1997). With a NAO perspective, networking is more centralized, involving intended and formal practices rather than spontaneous interactions among nearby KIBS. Our results likely generalize to other contexts, including science-based and technological parks (Lai and Shyu 2005), where NAOs have important governance functions.

This quantitative evidence reaffirms Parker and Hine's (2014) case study findings: Knowledge intermediaries affect learning capabilities by influencing firms' network relationships, which in turn affect their ability to use knowledge. The role of knowledge intermediaries might be more extensive than facilitating interactions in innovation systems, in that knowledge intermediation could affect firms' ability to absorb external knowledge. The current study contributes to existing literature on KIBS' innovation in three main ways. First, we focus on the sources of KIBS' innovation *per se*, not their role in other firms' innovation. Second, by concentrating on KIBS co-localized in a cluster and noting prior findings regarding the antecedents of innovation in KIBS (Koch and Strotmann 2008), we denote the importance of both internal capabilities and external linkages for innovation intensity. Third, the findings confirm that small-cluster KIBS require intermediaries need to boost their innovation capability and reveal the role of NAOs as key intermediary organizations in these clusters.

These results should inform both academic research and government policy initiatives, in that they help clarify the types of actions cluster governance structures should pursue to foster members' innovation and provide regional innovation systems with the necessary tools for improved economic development (Uyarra 2010). In line with evidence about the benefits of innovation intermediaries for small manufacturing firms (Spithoven et al. 2010), we show that KIBS, despite serving as complementary innovation agents for other firms (He and Wong 2009), also need intermediaries to boost their own innovation.

Studying innovation by KIBS also is vital for knowledge-based economies, because of their role as innovation agents for all other firms. Further research should generalize our results with larger samples and assess interactions of KIBS as innovation facilitators with their own innovation activity (Gallouj 2002; Strambach 2001). The complementary roles of intermediaries such as local NAOs and KIBS suggest the need for research that analyzes the characteristics of clusters and their effects on innovation, especially with regard to their respective roles.

Having been in existence for 30 years, Savoie Technolac successfully implements networking incentives; industry–research collaborations arise mainly through induction by the NAO. Most studies suggest the need for sufficient time to establish an effective network of relationships across industry, research, and education, so the actors can construct a common history (Torre and Rallet 2005). However, time might not influence cluster governance forms, because "once established, evolution from an NAO to another form is unlikely (i.e., inertia is strongest when the governance form is more formalized)" (Provan and Kenis 2008, 247).

This study also offers some public policy recommendations. First, NAOs should pay particular attention to the internal resources they help

KIBS develop. They are not limited to passive monitoring roles but instead can offer additional strategic resources that help firms achieve their R&D projects. Because a cluster's governance structure should reflect a strategic vision of the research projects in its territory, NAOs can readily find appropriate partners to meet their innovation knowledge needs. Second, small businesses have limited resources, so the direct provision of external resources can be risky, even if it seems conducive to innovation. Rather, to handle these external resources, KIBS need to develop internal resources through their absorptive capability. The NAO has a strategic role in this context, to encourage increased absorption capacity among these firms.

Finally, several limitations of this research stem from the sample specificities. Although representative of the Savoie Technolac KIBS, the sample is relatively small and subject to great heterogeneity across subsectors—a general problem for all KIBS research. This limited size does not allow for distinctions of various categories of KIBS, though the intermediary role of NAO in fostering members' innovation may vary with KIBS specificities, activities, or sizes. It also does not allow us to consider NAOs' distinct effects on different types of innovations or offer a robust test of the relationship in different sectors. Research with larger samples would represent a good extension. In a similar vein, because previous studies on NAOs do not use latent constructs, it would be useful to replicate our composite variables with other populations (e.g., non-KIBS firms) and contexts (e.g., U.S. clusters) to ensure the external validity of our measures. Further research also could enhance empirical knowledge of the role of NAOs in boosting firms' innovation by providing a thorough, qualitative study of best practices, according to the stage of KIBS development or the level of absorptive capacity. Our study provides a snapshot of the role of a cluster intermediary at a particular point in time. Further developments with a temporal perspective could clarify the changing role of cluster intermediaries over time.

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Appendix 1

Descriptive Statistics (*n* = 53)

Variables	Definition		0		1
INTERNAL_R&D	Firm's internal R&D between 2006 and 2008 (Yes = 1; No = 0)		19 (35.8)		34 (64.2)
DEDICATED_ ACTOR_INNO	Firm's recruitment of dedicated personnel to innovation between 2006 and 2008 (Yes- = 1; No = 0)		35 (66.0)		18 (34.0)
COLLAB_UNIV	Firm's collaborations with university to innovate between 2006 and 2008 (Yes = 1; No = 0)		28 (52.8)		25 (47.2)
ING_SECTOR	Firms belongs to engineering sector (Yes = 1; No = 0)		35 (66.0)		18 (34.0)
CONSULTANT_INNO	Firm's collaborations with consultants to innovate between 2006 and 2008 (Yes = 1; No = 0)		37 (69.8)		16 (30.2)
PATENT_EXT	Firm's patents, licenses or industrial design acquisitions to innovate between 2006 and 2008 (Yes = 1; No = 0)		46 (86.8)		7 (13.2)
		1	**2**	**3**	**4**
INNO_INTENSITY	Firm's degree of innovation novelty between 2006 and 2008 (1 = no innovation; 2 = incremental innovations; 3 = innovations new for the firm; 4 = innovations new for the firm and the market)	10 (19.2)	11 (21.2)	9 (17.3)	23 (42.3)
SIZE	Firm size (=1 if less than 5 employees, =2 if 5 to 9 employees; =3 if 10 to 49 employees, =4 if more than 50 employees)	25 (47.2)	12 (22.6)	13 (24.5)	3 (5.7)
		0	**1**	**3**	**4**
SERVICES_ST	Firm's use of the ST networking business services between 2006 and 2008 (1 = never; 2 = occasionally; 3 = frequently; 4 = very often)	32 (60.4)	3 (5.7)	11 (20.8)	7 (13.2)
ST_RELATIONS	Firm's use of ST team to put it in relation with some innovation partners between 2006 and 2008 (1 = never; 2 = occasionally; 3 = frequently; 4 = very often)	36 (67.9)	4 (7.5)	10 (18.9)	3 (5.4)

Size by Sector

Full-time employees	<5		5–9		10–49		>50		Total
NACE/NAF V2 2008	*N.*	Percentage	*N*	Percentage	*N*	Percentage	*N*	Percentage	*N*
58	1	14.30	2	28.60	4	57.10	0	0.00	7
62	6	46.20	4	30.80	2	15.40	1	7.70	13
70	4	80.00	1	20.00	0	0.00	0	0.00	5
71	9	50.00	2	11.10	5	27.80	2	11.10	18
73	1	33.30	1	33.30	1	33.30	0	0.00	3
74	1	25.00	2	50.00	1	25.00	0	0.00	4
78	1	100.00	0	0.00	0	0.00	0	0.00	1
85	2	100.00	0	0.00	0	0.00	0	0.00	2
Total	25	47.20	12	22.60	13	24.50	3	5.70	53

Appendix 2

Cross-Loadings, Model 1

	Extern Resources	Intern Resources	Intermediary_ role	Ing_ sector	Size	Inno_ intensity
Patents_ext	0.738	0.307	0.229	−0.010	0.314	0.259
Collab_Univ	0.650	0.496	0.230	0.137	0.017	0.268
Consultant_inno	0.823	0.524	0.335	−0.106	0.182	0.348
Ing_sector	−0.007	−0.170	−0.339	1.000	0.161	−0.031
Inno_intensity	0.399	0.391	0.338	−0.031	−0.176	1.000
ST_relation	0.321	0.387	0.861	−0.303	−0.056	0.237
Services_ST	0.263	0.280	0.746	−0.239	−0.159	0.322
Dedicated_ actor_Inno	0.575	0.708	0.274	−0.162	0.307	0.243
Internal_R&D	0.428	0.873	0.383	−0.119	−0.019	0.365
Size	0.229	0.142	−0.124	0.161	1.000	−0.176

Cross-Loadings, Model 2

	Extern_ resources	Ing_ sector	Inno_ intensity	Intermediary_ role	Intern_ resources	Intern_resources * Intermediary_role	Size
Patents_ext	0.726	−0.010	0.259	0.230	0.338	0.313	0.314
Collab_Univ	0.688	0.137	0.268	0.231	0.505	0.198	0.017
Consultant_inno	0.800	−0.106	0.348	0.334	0.536	0.244	0.182
Ing_sector	0.003	1.000	−0.031	−0.340	−0.177	0.044	0.161
Inno_intensity	0.399	−0.031	1.000	0.336	0.381	0.192	−0.176
ST_relation	0.322	−0.303	0.237	0.868	0.389	0.267	−0.056
Services_ST	0.260	−0.239	0.322	0.735	0.263	0.085	−0.159
Dedicated_actor_Inno	0.578	−0.162	0.243	0.276	0.798	0.192	0.307
Internal_R&D	0.433	−0.119	0.365	0.383	0.798	0.033	−0.019
Dedicated_actor_ Inno *Relation_ST	0.183	0.008	0.199	0.255	0.209	0.670	0.034
Dedicated_actor_ Inno *ST_services	0.327	0.103	0.115	0.049	0.099	0.839	−0.002
Internal_R&D *Relation_ST	0.111	−0.116	0.156	0.345	−0.027	0.463	0.029
Internal_R&D *ST_services	0.040	−0.048	−0.072	0.171	−0.069	0.418	0.054
Size	0.221	0.161	−0.176	−0.123	0.180	0.024	1.000

Appendix 3

Correlations and AVE Square Roots, Model 1

	Extern Resources	Intern Resources	Intermediary_ role	Ing Sector	Size	Inno Intensity
Extern_resources	0.740					
Intern_resources	0.606	0.795				
Intermediary_role	0.365	0.421	0.805			
Ing sector	−0.007	−0.170	−0.339	1.000		
Size	0.229	0.142	−0.124	0.161	1.000	
Inno_intensity	0.399	0.391	0.338	−0.031	−0.176	1.000

Notes: The square root of the average variance extracted appears on the diagonal.

Correlations and AVE Square Roots, Model 2

	Extern_ resources	Ing_ sector	Inno_ intensity	Intermediary_ role	Intern_ resources	Intern_ resources * Intermediary_ role	Size
Extern_resources	0.740						
Ing_sector	0.003	1.000					
Inno_intensity	0.399	−0.031	1.000				
Intermediary_role	0.364	−0.340	0.336	0.805			
Intern_resources	0.633	−0.177	0.381	0.413	0.798		
Intern_resources * Intermediary_ role	0.335	0.044	0.192	0.234	0.141	0.606	
Size	0.221	0.161	−0.176	−0.123	0.180	0.024	1.000

Notes: The square root of the average variance extracted appears on the diagonal.