How much do firms imitate each other?
The role of external search strategies in KIBS firms[*]

Stefano Li Pira
Warwick Business School, University of Warwick (UK)
Email: stefano.li-pira@wbs.ac.uk

Anna Cabigiosu
Department of Management, Ca' Foscari University Venice (Italy)
Email: anna.cabigiosu@unive.it

Diego Campagnolo
Department of Economics and Management, Padova University (Italy)
Email: diego.campagnolo@unipd.it

Abstract

Purpose. Despite many firms rely on a wide range of external partners to achieve and sustain innovation, we still know little about if and how firms' openness to external sources of information affects firms' imitation strategy. We conceptualize openness as the involvement of a heterogeneous range of actors and sources. Approaching this underexplored area of research, we apply information-based theory of imitation to evaluate how firms decide how much to imitate by compensating their information deficiency via external partnerships.

Methodology. We test our hypotheses using a large-scale sample of Italian knowledge intensive business service (KIBS) firms, a very relevant setting for an increasing knowledge-based economy.

Findings. Our findings show that both external search depth and breadth affect firms' imitation propensity. When the depth of exchanges is high, and firms draw deeply from external sources, KIBS firms increase their level of imitation, while the breadth in the number of external sources takes a curvilinearly (U-shaped) relationship with the imitation propensity.

Practical implications. Managers, who operate in complex and uncertain environments, can rely on external partnerships to explore the external environment and define how much to imitate rivals.

Originality/value. We contribute to the strategic management and KIBS literature by applying information-based theories of imitation to firms' external search strategy and by identifying new original antecedents to imitative behavior.

Keywords
Imitation; information; external partners; KIBS

---

[*] Stefano Li Pira wrote the Introduction, Theory and Hypotheses, Methods, Results and Discussion and conclusions section. Anna Cabigiosu wrote the Introduction, Theory and Hypotheses, Methods, and Discussion and conclusions section. Diego Campagnolo wrote the Introduction, Theory and Hypotheses and contributed to the Discussion and conclusions section.

1. Introduction

Strategic management literature has so far widely emphasized the relevance of imitation in explaining industry dynamics and firms' performance. Innovators are not necessary market leaders and imitation may help firms surviving especially in uncertain and complex environments (Suarez and Lanzolla, 2007).

Several authors have explored under which conditions firms imitate focusing both on industry and firm-specific variables. In a seminal paper Lieberman and Asaba (2006) suggest that environmental uncertainty is crucial in explaining imitative behaviors. Also, different endowments of past experience and technical competence are expected to be major drivers of the firms' ability to imitate or to adapt to a changing environment (Jansen et al., 2006; Tushman et al., 2010; Foss et al., 2011). However only a very few studies have investigated how managers manipulate different strategic levers to enhance perceptions of strategic positioning and define the optimal level of imitation (Tushman and O'Reilly, 1996). In particular these studies have exclusive focus on intra-organizational dynamics with a lack of attention to mechanisms that define the organizational boundaries through which local or non-local search is managed (Laursen, 2012) and how these strategies influence how much firms imitate.

This is surprising as nowadays firms rely on a network of partners, such as clients, consultants or universities, to explore the environment and improve their offer. External partners may help firms' understanding of existing technologies, products and processes developed either by competitors or by the partners themselves. External actors help firms in their search for opportunities to achieve and sustain innovation, but also to exploit external knowledge sources with the aim of following successful early movers (Chesbrough, 2011). Firms often invest in building partnerships to facilitate the learning from others, monitor the environment, and better calibrate the choice of whether and when adopting new products and services (Gulati, Nohria and Zaheer, 2000; Kale and Singh, 2007).

Hence, this paper explores the relationship between firms' external search strategy and how much firms imitate innovations introduced by others. In particular this paper builds on information-based theories of imitation and explores the relationship between firms' external search strategy and their propensity to imitate innovations introduced by others. Lieberman and Asaba (2006) suggest that firms may either imitate competitors with similar size and resources to maintain competitive parity, i.e., rivalry-based imitation, or imitate the most successful competitors when environmental uncertainty is high, because they are perceived as having superior information about future market trajectories, i.e., information-based imitation. The critical differentiating characteristic, however, in favoring one theory over the other, is level of information asymmetry among industry members (Semadeni and Anderson, 2010). Situations of high information asymmetry are typically found in highly uncertain and complex environments where different market actors possess different bodies of knowledge (Gimeno and Woo, 1996). In this case information-based motivations prevail (Semadeni and Anderson, 2010).

Hence, building on Lieberman and Asaba (2006) and Semadeni and Anderson (2010) we develop original hypotheses that correlate information-based theories of imitation with firms' external search strategy. In particular we suggest that two attributes of an external search strategy affect how much firms imitate: the breath, which is the number of different partners a firm has, and the depth, which captures the intensity of knowledge and information sharing with partners (Larsen and Salter, 2006; Love, Roper and Vahter, 2014). Our argument is that, in complex and uncertain environments, (a) the breadth of an external search strategy has a U-shaped relationship with imitation: breath decreases information asymmetry and environmental uncertainty thus reducing the propensity to imitate. The more firms acquire

knowledge and information from different partners the lower is the information asymmetry and environmental uncertainty and the lower the incentive to imitate. Nevertheless too high levels of breath may lead firms to decision imbalance. This overload of information may raise the perceived environmental complexity and the incentive toward imitation; (b) depth improves learning from external partners and positively affects firms' ability to absorb and use external knowledge and the propensity to imitate.

We test our hypotheses using a large-scale sample of knowledge intensive business service firms (KIBS) located in Italy. As suggested by Semadeni and Anderson (2010), KIBS operate in a complex, heterogeneous and uncertain environment characterized by the continuous need to adapt their services to their clients' needs (Love et al., 2011; Miles, 2005; Miozzo et al., 2016; Pina and Tether, 2016; Tether, 2005). KIBS firms include professional, design, communication and ICT firms (e.g. software consultancy and supply, data processing, database activities, business and management consultancy activities, market research, etc.). These businesses are unified in their characteristics of being knowledge-intensive, complex and continuously evolving services. A defining feature of KIBS firms is that they are involved in continuous knowledge transfer with other organizations, such as clients, suppliers and research centers (Bettencourt et al., 2002; Gallouj, 2002). Moreover the "knowledge intensity" characteristic of these services indicates that the production of a firm output relies in a substantial body of complex knowledge (Starbuck, 1992; Winch and Schneider, 1993) that is retained by the individual collaborators of the firm (Alvesson, 2000; von Nordenflycht, 2010). These elements determine two main characteristics of the KIBS: a relative autonomy of the internal collaborator and a consequent opacity of the quality of service offered to clients that cannot evaluate *ex-ante* the value of the service offered. For these reason the KIBS services are often the outcome of a joint effort by the service provider and its partners (den Hertog, 2000). With few exceptions, KIBS firms do not typically have R&D departments. Instead, services tend to be developed during specific projects with external partners and for clients (den Hertog et al., 2010; Miozzo et al., 2016; Pina and Tether, 2016).

The rest of the article is organized as follows. We first draw on imitation and open innovation literature to develop a set of hypotheses. Next we provide a description of the research context and the research methods respectively. We then present the results and the article concludes with an explanation of the contributions of our findings.

2. Theory and hypotheses

2.1. The external search strategy and imitation: a need for resources

In this section we propose a theoretical connection between a firm's use of external sources of knowledge and its propensity to imitate innovations introduced by others. The literature on imitation suggests that external sources are the links through which firms access critical resources. The need of resources is consequently one of the most important determinants to establish external partnerships (Ahuja, 2000; Soda, Zaheer and Carlone, 2008). Indeed in competitive contexts where it is important to monitor others' behaviors, connection is important to capture new ideas, reproduce and recombine them to match rivals' success. In this perspective the network of relationships that the focal firm establishes is a "search and monitoring mechanisms for each other's strategies and actions, increasing, in the process, the cognitive salience of some competitors relative to others" (Gnyawali and Madhavan, 2001: 432).

Chesbrough (2003) suggests that firms investing in broader, deeper and intensive search are more likely to collect superior information. Collaboration with suppliers, clients or research center increases firms' understanding of available and leading technologies, clients'

needs and overall reduces environmental uncertainty. Eventually, when firms share partners with competitors, firms may also increase their understanding of competitors' strategy. In this paper we claim that external search strategy reduces firms' information asymmetry and the perceived environmental uncertainty and, consequently, mitigates the incentives toward imitation.

This is especially true for KIBS firms that are in mean micro firms and do not have an R&D area (Muller and Zenker, 2001). Instead, they widely rely on the competences of their knowledge intensive workers and on external partners. KIBS firms innovate (imitate) collaborating with partners that have complementary competences and with whom they share the risk of developing new services (Love and Mansury, 2007; Love et al., 2011; Mansury and Love, 2008; Muller and Zenker, 2001).

Furthermore, external search strategy increases the firm's likelihood to collect data, information and ideas that can be either original or originally recombined between them: the more firms interact with external partners the higher is the probability that, other things being equal, they will develop new building-blocks of knowledge that recombined generate new solutions (Galunic and Rodan, 1998).

Overall, external search strategy increases firms' understanding of the environment and its ability to identify original solutions. In this context firms are less likely to imitate. Nevertheless, as suggested by Laursen and Salter (2006), two are the crucial dimensions of an external search strategy that may differently affect how much firms imitate: the breadth and the depth. The first concept refers to the variety of external search, which is defined as the number of different external partners that firms rely upon in their research and development activities. The second concept refers to the external search depth, which is defined as the level of involvement of external sources in the collaboration with the firm. These two variables represent the openness of firms' external search strategies and the mechanisms trough which they affect imitation propensity are discussed in the next paragraphs.

2.2. The relationship between search breadth and imitation

Lieberman and Asaba (2006) describe the phenomena of "information cascades": in uncertain environments firms observe the actions of leading competitors and follow their behavior. This is the bandwagon-effect: the actions of some firms are weighted more strongly than others if such firms are perceived as having superior information. In complex and uncertain environments firms imitate competitors to cope with the intelligibility of the environment and to somehow legitimate their choices.

In complex and uncertain environments market knowledge is heterogeneous: if firms grasp only a small peace of such heterogeneity they are more likely to imitate. Alternatively, firms (especially small firms) can proactively manage and reduce environmental uncertainty by collaborating with diverse partners that increase their understanding of clients' needs, existing trends and available technologies.

Complex environments resemble puzzles made of hundreds of pieces. Each partner represents a piece of information and knowledge of the entire environment: the variety of partners increases firms' ability to understand and monitor its competitive landscape and allows completing the puzzle.

When firms have multiple sources of information and knowledge, i.e. breath of external partners is high, firms are less likely to imitate because: a) they have a more in-depth understanding of the environment in that they can rely on multiple sources of information and knowledge; b) they increase their chance of developing original solutions by recombining multiple knowledge-bases. As Nutt (1998) and Rivkin (2000) suggest, importing knowledge from other firms is one of the most frequent tactics to improve firms' problem solving.

The choice of a broad set of external sources will enable firms to gain a good understanding of what other firms are doing and about their market perception. Indeed firm with a high external search breadth often have better information and are less likely to imitate (Baum & Singh, 1994).

Particularly, market information is crucial for KIBS firms because they have to continuously adapt their services to clients' needs and to their specific business (Cabigiosu et al., 2015). Hence, collaborating with clients is essential to be perceived as a performing problem-solver and service provider. In this setting, KIBS firms rely on other KIBS, universities and research center to improve their effectiveness. Finally, the choice of a broad set of sources will enable them to gain a good understanding of what other competitors are doing with different types of collaborators.

In sum, if firms have a high breath of external partners they face a lower level of information uncertainty and asymmetry and they have a lower incentive to imitate competitors: firms do not need to imitate rivals in that they believe the latter are better informed. A wide set of partners reduces information asymmetry and increases firms 'problem solving ability.

Nevertheless, we recognize that firms with too many different partners may face an information overload and decision imbalance. This is especially true for small firms and for KIBS firms that are in mean micro firms. When firms have a high variety of partners they may not have enough resources to exploit to the fullest each partnership and to gain an in-depth and correct understanding of the information they provide.

Furthermore, multiple perspectives may not be easy reconciled in a consistent framework. When puzzles are too big, made by different pieces, synergies and complementarities between them may be more hardly identified and the puzzle complexity may exceed small firms' combinatorial ability.

We thus propose the following hypothesis:

Hypothesis 1. External search breadth has a U-shaped relationship with imitation.

Overall, while external search breath improves firms' ability to monitor complex and heterogeneous environments, characterized by multiple and different actors, another variable, the depth of information and knowledge exchange with such partners measures how much a firm is able to grasp to the fullest partners' information and knowledge endowments.

2.3. The relationship between external search depth and imitation

Depth refers to the level of involvement of external sources in the collaboration with the firm. This variable captures how much firms collaborate with external partners. Firms can exchange personnel, sharing technological or commercial solutions, co-develop new products and processes. The more firms collaborate with, and learn from, external partners, the ticker is their relationship.

Imitators heavily invest in external sources of knowledge to build absorptive capacity and to facilitate learning from others and to speed imitation processes. Cohen and Levinthal (1990) have shown that a successful use of external knowledge is influenced by the learning processes and the adoption of new knowledge is smoother and less problematic when can be added to the knowledge structure already available within the firm. Therefore when there is a high level of external search depth it indicates firm's commitment in acquiring and adapting the existing knowledge to the firm specific situation. They acquire explicit and tacit knowledge about the partner and adapt partner's innovative problem solutions to the organization specific requirements, firm's structure and culture (Strambach 2001).

The deep use of external sources promotes and eases the exchange of information with external partners (Uzzi, 1996). Also the KIBS literature suggests that an in-depth understanding and collaboration with partners are essential for an effective knowledge

transfer (Miozzo et al., 2016). In KIBS, the level of firms' involvement in external partnerships affects firms' capacity to exchange knowledge, effectively collaborate with partners and learn from them. Therefore the depth of relationships that KIBS firms have with their partners indicates how much KIBS firms are able to learn from the outside as well use external knowledge effectively. This way firms acquire both explicit and tacit knowledge from their partners (Strambach, 2001).

In this paper we suggest that the depth of an external search strategy measures the firm's ability to grasp to the fullest the knowledge and information that external partners have. While the breath is a mechanism of scanning of the uncertain environment and measures how many different partners a firm has, the depth measures how much firms invest in knowledge and information sharing with partners. While the breath counts the number of puzzle pieces that I have, the depth measures how much I know such pieces.

In uncertain and complex environments, the breath increases the firms' ability to monitor its competitive landscape, while depth captures how deeply firms' rely on external partners and firms' possibility to grasp someone else experience. Therefore, while breath reduces uncertainty and the propensity toward imitation, depth measures firms' willingness to absorb external knowledge.

Depth captures how much firms invest in knowledge and information sharing with partners. This collaboration is the precondition to acquire, use and integrate new knowledge and is a precondition of imitation and innovation strategies. Hence depth: a) increases firms' understanding and usability of external partners' knowledge and the firms' ability to replicate and imitate externally produced solutions; b) allows creating collaborative and tight relationships with external partners and generate the precondition to use their knowledge. As far as imitation is concerned we therefore hypothesize:

Hypothesis 2. External search depth is positively related to imitation.

3. Methods

3.1. Industry setting

KIBS firms are business-to-business service firms that include professional (e.g., legal and accountancy services), ICT, design and communication firms (Bettencourt et al., 2002). KIBS have increasingly attracted the attention of scholars in the last 15-20 years as their role in the so-called "knowledge economy" has increased (Pina and Tether, 2016). These businesses are unified in their characteristics of being knowledge- (rather than capital-) intensive. A defining feature of KIBS firms is that they are involved in the continuous knowledge transfer with other organizations, especially with clients. Also, all KIBS firms are unusually high in terms of human capital measured as the share of graduate employment compared to firms in other sectors. With few exceptions, KIBS firms do not typically have R&D departments. Instead, innovations tend to be developed during projects for clients (Miozzo et al., 2016).

Innovation in KIBS firms has been studied from various perspectives, one of which is how KIBS firms produce and circulate knowledge, and foster innovation processes at client level (Strambach, 2001). Less attention has been devoted to the innovation and imitation processes within a KIBS firm (Amara, Landry and Doloreux, 2009; Corrocher, Cusmano and Morrison, 2009). Research findings indicate that KIBS firms often innovate in collaboration with external partners and particularly with clients (Hipp and Grupp, 2005; Love and Mansury, 2007; Larsen, 2000). Collaboration for innovation has long been the norm for KIBS firms, which rely heavily on technical or professional knowledge to solve the problems of their clients (Miles, 2005; Miozzo et al., 2016). For example, Cabigiosu et al. (2015) describe how an Italian third-party logistic service provider (TPL) introduced the track-and trace service via

an intense collaboration with Netslè-Purina: the TPL imitated a new service thanks to the collaboration with its main client.

Furthermore KIBS compete in heterogeneous, complex and uncertain environments thus suggesting that for these firms information-based theories of imitation can better explain how much KIBS firms imitate competitors (Semadeni and Anderson, 2010). Environmental heterogeneity is driven by KIBS' clients needs that are often firm-specific and require adaption. Furthermore, KIBS firms need multiple competences to deliver their services, such as marketing firms that provide communication services and need ICT competences to develop web-sites. Furthermore, the economic crisis of the period herein considered (2006-2008) increases the uncertainty about growth direction and future investments of KIBS firms. Finally, by definition, KIBS firms provide customized and knowledge intensive services which display a high level of complexity.

Since KIBS firms create knowledge assets regularly and jointly with external partners and since they constitute a relevant and fast growing industry, we decided to focus the analysis of the relationship between external search strategies and imitation in this specific setting.

3.2. Sample

We collected our dataset in 2009 by conducting a survey of KIBS firms in the Veneto region of North-East Italy, which is one of the most highly-developed regions in Italy and Europe in terms of the employment rate and per capita GDP (Unioncamere, 2010). In 2005, 18.4% of Veneto firms operated in the manufacturing sector, 35.4% in commerce, 18.7% in the construction sector, 5.5% in personal services, and 7.1% in the business services sector (Unioncamere, 2005). While the percentage of business service firms in the Veneto was lower than the average for the other Italian regions at the beginning of this century, the Veneto is now one of the Italian regions with the highest share of business service firms (Unioncamere, 2008).

In 2009, there were 7,049 KIBS firms in the Veneto. We analyzed this sector by drawing from two sources: (a) the Business Register held by the Italian Chambers of Commerce; and (b) the records of the Association of Professional Accountants to obtain data on KIBS firms not registered with the Italian Chambers of Commerce. We randomly extracted 2,984 KIBS firms that were contacted by phone by a specialist survey company. We ultimately collected answers from 512 firms (with a response rate of about 17.2%). Because of missing responses on some of the more sensitive data required for the analyses in this study (number of imitations, number of collaborators and percentage of graduate employees at year 2008) the usable number of surveys for the present study was reduced to 380 (a 12.7% response rate). A closer response analysis broken down on industries reveals the sample was representative of the universe of KIBS firms and homogeneous in terms of the nature of the services they provided: 30.5% of the overall sample consisted of ICT firms (ATECO[1] Code: 72), 30.7% were design and communication firms (ATECO Code: 74.13, 74.2, 74.4), and 38.8% were professional firms (ATECO Code: 74.1).

The survey company collected the data by means of telephone interviews with the KIBS firms' entrepreneurs or managers. The interviews were based on a broadly structured questionnaire consisting of 36 questions designed to collect data for this and other research projects on KIBS firms. The questions, items, and scales in the questionnaire had been tested in previous, similar studies (Corrocher et al., 2009; Hipp et al., 2000; Muller and Zenker, 2001; Tether et al., 2001). The questionnaire contains three sections on (a) business characteristics, (b) entrepreneurial processes and organization and (c) services and relations. The questions/items for the purpose of this study are summarized in the Appendix.

---

[1] Italian classification of economic activities used by ISTAT (the Italian national institute of statistics).

We specifically trained the survey company on how to interview the KIBS firms, spending a whole day with the interviewers on the questionnaire to ensure that all the questions were clear. We also assisted the interviewers during the first 5% of the interviews they conducted. We specifically asked them to interview the entrepreneur/owner or the most knowledgeable informant (e.g. a person on the top management team). Although multiple informants have been preferred in other surveys (Kumar, Stern and Anderson, 1993), we used a single informant because questioning multiple informants when one in particular is the most knowledgeable can pose problems (Glick et al., 1990), particularly in the case of our KIBS firms because they were often very small (the 512 firms analyzed had an average of 7 employees each).

Finally, common method variance may be another potential shortcoming, given that the data on dependent and independent variables were collected from the same respondents (Podsakoff and Organ, 1986). We believe that our study does not suffer from a common method bias, however, because: (a) some of our findings are based on quantitative/objective data, which are unlikely to be distorted by common method variance (Brockner et al., 1997); (b) we did not explain the object of our research to respondents (i.e. we did not influence them ex-ante); (c) the questions on the dependent and independent variables in this study were placed at the beginning and end of the questionnaire, which contained several items that were not used in this study; this would considerably reduce the chances of respondents intentionally distorting their answers.

3.3. Measures

Dependent variable
Firm imitation. We assessed the level of imitation by asking to firms in our sample how many product and process innovations new to the firm but not to the industry, i.e. already present in the market, they introduced in the last three years (Mansury and Love, 2008; Therrien et al., 2011).

Independent variables
As determinants of imitation we have introduced two variables reflecting different dimensions of the openness of firms' external search strategies.

External search breadth. This variable assesses the number of different partners of each KIBS firm. For each KIBS firm we asked if the following 8 partners (see Table 1) belong or not to its network: consultants (design, marketing and communication), consultants (ICT), consultants (professional services), engineering offices/laboratories/test centers, government offices, university or other research institutes, scientific parks, others (craftsmen, freelancer, accountants, lawyers, etc.). Each time the KIBS firm answered "yes" we assigned the value "1", "0" otherwise. Overall, this variable spans from "0", meaning that the KIBS firm has no external partner, to "8", which is the maximum number of different partners. Although the variable is a relatively simple construct, it has a sufficient degree of internal consistency (Cronbach's alpha coefficient = 0.68). Furthermore, the scale has theoretical relevance as a measure of external search breadth (Laursen and Salter, 2007).

Table 1. External search breadth: number of partners, year 2009 (n=380)

Knowledge source	Percentage
Consultants (Design, marketing and communication)	26.32
Consultants (ICT)	33.95
Engineering office, laboratories, test centers	12.37
Consultants: Professional services	28.42
Government offices	5.79
University and other research institutes	7.37
Scientific parks	4.47
Others (Craftsmen, freelancer, accountants, lawyers…)	17.11

External search depth. This variable measures in how many areas KIBS firms collaborate with external partners. The areas we investigated are: exchange of personnel, sharing of technological solutions, sharing of commercial solutions (clients, markets), creation of new products/processes, or other (see Table 2). Each time the KIBS firm claims to collaborate in one of these areas we assigned the value "1", "0" otherwise. Overall, this variable spans from "0", meaning that the KIBS firm does not collaborate with external partners in these 4 areas, to "4", meaning that the KIBS firm has collaborations in all these areas. This measure was used despite a low Cronbach's alpha of 0.61, because the low internal consistency was partly due to the skewed distributions of the individual items. Furthermore, the scale has theoretical relevance as a measure of external search depth (Laursen and Salter, 2007). Although our list of areas of partnership may not be fully comprehensive, it is enough extended, the items are not mutually exclusive, and this list reflects the most diffused partnerships in the sector (Love and Mansury, 2007).

Table 2. External search depth: areas of exchange with external partners, year 2009 (n=380)

Type	Percentage
Exchange of personnel	8.16
Sharing technological solutions	39.21
Sharing commercial solutions (clients, markets)	27.37
Creation of new products/processes	41.05
Other informal agreements (Consultancy, information, legal)	3.68

Control variables

Number of employees. Firm size is the number of employees of the firm in the year 2008. With this variable we control for the propensity to imitate across different levels of firm resources.

Percentage of graduate employees at year 2008. This variable controls the effect of human capital by measuring the percentage of employees with a bachelor or higher degree in the year 2008.

Number of collaborators. This variable counts the number of collaborators of the firm. In the questionnaire the respondent has to specify the number of collaborations in 5 geographical areas (Regional, National, EU, Continental, World). We summed the value of the 5 independent variable and we normalized the value in a range between 0 and 1 (maximum level of collaboration in the sample). Overall, while *External search breadth* captures the variety of KIBS firms' partners, with this variable we count the overall number of relationships.

Client search breadth. This variable assesses the relevance of clients as a source of knowledge in four different areas (technological research, new product development, process improvement and entrance in new sectors/segments, see Table 3) using a 1-5 scale. We

transformed each item in a dummy variable specifying if its level is over (1) or under (0) the median level of the sample. Then we summed all the dummy variables to obtain a construct that has a high degree of internal consistency (Cronbach's alpha coefficient = 0.82).

Client search depth. This variable assesses how much KIBS firms invest in communication channels and integration with clients. This construct relies on three items (see Table 4) describing how frequently, on a 1-5 scale, KIBS firms dedicate to each client a specific referent, clients have multiple referents and clients have a web platform to interact with the firm. We transformed each item in a dummy variable specifying if the frequency was above (1) or under (0) the median level of the sample. Then we summed all the dummy variables to obtain a measure of depth. We have relayed on this construct as the Cronbach's alpha coefficient is 0.75.

Table 3. Breath of information and knowledge sharing with clients, year 2009 (n=380)

Type	Percentage
Technological research and competence enhancement	62.63
Development of new products and services	71.32
Development service production processes	58.16
Market entry decision	66.58

Table 4. Depth of relationships with clients, year 2009 (n=380)

Type	Percentage
Clients have a unique and dedicated referent within the firm	62.50
Clients have multiple referents within the firm	63.28
Clients have a web platform to interact with the firm	100.00

R&D competences. We used this variable to control for the innovation capabilities of the firm. We could not control for R&D investments because the firms in our sample are micro firms that usually do not report or are unable to estimate R&D investments therefore we used one question of the survey where it was asked to report the number of innovations introduced in the last three years.

Firm's activities diversification. We also controlled for the firm's existing level of diversification using the Herfindahl measure of sales distributed across the six largest firm's business areas of specialization (it is computed as the sum of squares of the percentage of total sales across all firm's activities).

Firm age dummies. In order to control for the breadth of openness of young firms, we used two dummy variables indicating whether the firm has been founded (a) in the last three years, (b) between six to nine years ago or (c) more than nine years ago.

Sector dummies. We include three dummy variables to account for different propensity to innovate across the ICT sector, the Professional service sector and the Design and Communication sector.

Appendix 1 shows for each variable the scale and questionnaire items we used for their measurement.

4. Results

The dependent variable in the regression model is a count variable, accordingly a Robust Negative Binomial regression model is applied. Descriptive statistics are given in Table 5.

Table 5. Descriptive statistics

	Mean	Sd	1	2	3	4	5	6	7	8	9
1 **Number of imitation**	2.084	7.231	1.000								
2 **External Search Breadth**	1.358	1.607	0.075	1.000							
3 **External Search Depth**	1.195	1.228	0.096+	0.556**	1.000						
4 **Number of Employees**	5.861	7.856	0.060	-0.008	-0.053	1.000					
5 **Graduate Employee (%)**	31.737	35.766	-0.023	0.097*	0.054	0.035	1.000				
6 **Number of collaborators**	0.013	0.032	0.095+	0.220**	0.194**	0.078+	0.012	1.000			
7 **Clients Breadth**	2.587	1.529	0.071	0.113*	0.089*	-0.045	0.040	0.004	1.000		
8 **Client Depth**	2.242	0.435	-0.008	0.083+	0.069	0.072	-0.031	0.019	0.021	1.000	
9 **R&D Competencies**	0.924	0.861	0.127*	0.092*	0.040	0.118**	0.034	0.076+	0.028	0.010	1.000
10 **Firm's activities diversification**	0.275	0.268	0.060	0.166**	0.090*	0.125**	0.005	-0.031	0.095*	0.157**	0.045

Notes:
N = 380
$^+p<0.10$, $^*p<0.05$, $^{**}p<0.01$

Table 5b. Sample selection bias

	Sample		Missing values	
	Mean	Sd	Mean	Sd
External Search Breadth	1.358	1.607	1.939	1.680
External Search Depth	1.195	1.228	1.492	1.188
Number of Employees	5.861	7.856	9.985	30.979
Graduate Employee (%)	31.737	35.766	37.295	35.073
Number of collaborators	0.013	0.032	0.041	0.143
Clients Breadth	2.587	1.529	2.629	1.485
Client Depth	2.242	0.435	2.303	0.461
R&D Competencies	0.924	0.861	0.871	0.842
Firm's activities diversification	0.275	0.268	0.277	0.285
	N=380 (76,56%)		*N=132 (23.44%)*	

The sample contains 380 observations. The results of the Robust Negative binomial regression analysis can be found in Table 6. Model 1 shows the effect of the control variables on *Firm imitation*. In Model 2 the effects of the main independent variables (*External search breadth* and *External search depth*) are introduced. Finally, Model 3, the full model also includes the quadratic effect of *External search breadth*. The model Chi-Square is significant indicating that the model fits satisfactorily and the results can be meaningful interpreted.

As shown in Model 3 (Table 6), there is a statistically significant and negative relationship between external search breath and the number of imitations (*β= -0.47, p<0.05*), but this relationship reverse for high level of external search breadth. As demonstrated by the improvement in fit from Model 3, the firms with middle level of external search breadth appear significantly more likely to refrain from imitating new product or processes already present in the market, thereby supporting Hypothesis 1. Figure 1 graphically represents the relationship between firm external search breadth and the predicted number of imitations. This graph suggests that the firms with a high level of external search breadth are the one that are imitating more widely. They are followed by the firms with the lowest level of external search breadth. On the contrary the firms with the middle level of external search breadth are the least prone to adopt products or processes already present in the market.

Table 6. External search strategies on number of imitation: Robust Negative Binomial Regression

	Model 1	Model 2	Model 3
Constant	-0.53	-0.76	-0.53
	(0.72)	(0.75)	(0.75)
Main effects			
External Search Breadth		0.03	-0.47[*]
		(0.07)	(0.22)
External Search Breadth^2			0.07[*]
			(0.03)
External Search Depth		0.18	0.33[**]
		(0.11)	(0.13)
Controls			
Number of employees	0.03	0.05[+]	0.04[+]
	(0.02)	(0.02)	(0.02)
Graduate Employee (%)	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
Number of collaborators	13.97[**]	10.99[**]	11.35[**]
	(3.79)	(3.54)	(3.56)
Clients Breadth	0.11	0.12	0.14[+]
	(0.08)	(0.08)	(0.08)
Clients Depth	-0.23	-0.27	-0.35
	(0.28)	(0.28)	(0.28)
R&D Competencies	0.49[**]	0.49[**]	0.49[**]
	(0.15)	(0.16)	(0.15)
Firm's activities diversification	0.67	0.58	0.76
	(0.53)	(0.54)	(0.52)
Dummy Age<3year	-0.90[**]	-0.97[**]	-0.83[*]
	(0.33)	(0.33)	(0.34)
Dummy Age<9year	0.03	-0.17	-0.24
	(0.30)	(0.30)	(0.29)
Sector Dummies	*Included*	*Included*	*Included*
N	380	380	380
Log-pseudolikelihood	-551.81	-550.38	-548.44
Wald Chi2	43.26[**]	50.50[**]	59.30[**]
Pseudo R^2	0.03	0.04	0.04

Notes: Standard errors in parentheses: [+] $p < 0.1$, [*] $p < 0.05$, [**] $p < 0.01$

Figure 1. Predicted relationship between imitation and the breadth of search through external sources
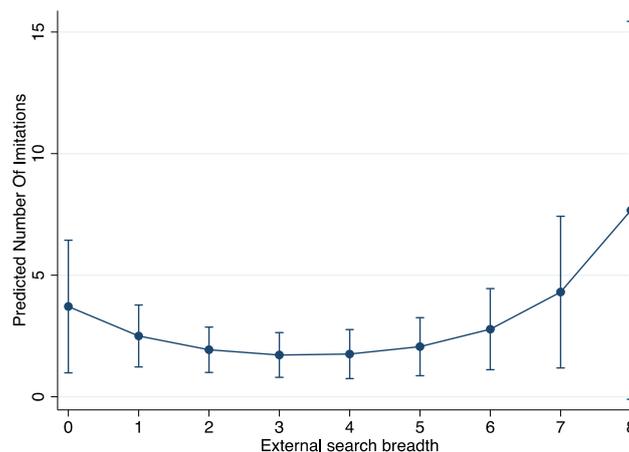
To further investigate this issue we estimated a model where we replaced *External search breadth* with three dummies, where the benchmark dummy is set for *External search breadth* equal to the level of external search breadth in the interval [7,8] (Table 7, Model 4). Consistent with the model presented here we found that firms with the highest level of

412

external search breadth are more likely to imitate. The coefficients indicate that the firms with the lowest level of external search breadth (*Dummy breadth, 0 partner*) have 0.37 times[2] the imitation events of those with the highest external search breadth (*Dummy breadth, 7-8 partner*). However, the medium level external search dummies indicate a lower level of imitation. The firms with one or two different partners (*Dummy breadth, 1-2 partner*) and those with three or four (*Dummy breadth, 3-6 partner*) have respectively 0.26 and 0.12 times[3] the imitation events of those with the highest external search breadth (*Dummy breadth, 7-8 partner*).

Hypotheses 2 predicted a positive effect of *External search depth* on *Firm imitation*. As shown in Model 3 (Table 7) this effect is positive and significant ($\beta= 0.33$, $p<0.01$). Figure 2 graphically describes the relationship between *External search depth* and *Firm imitation* and suggests that the more the firms have an higher level of external search breadth the less they refrain from imitating new products or processes already present in the market.

Table 7. External search strategies on number of imitation: Robust Negative Binomial Regression

	Model 4
Constant	0.33
	(0.95)
Main effects	
Dummy Breadth, 0 sources	-0.99[+]
	(0.55)
Dummy Breadth, 1-2 partners	-1.36[**]
	(0.42)
Dummy Breadth, 3-6 partners	-2.15[**]
	(0.45)
Dummy Breadth, 7-8 partners	*Benchmark*
External Search Depth	0.35[*]
	(0.14)
Controls	
Number of employees	0.04[+]
	(0.02)
Graduate Employee (%)	0.01
	(0.00)
Number of collaborators	11.87[**]
	(3.67)
Clients Breadth	0.17[*]
	(0.08)
Clients Depth	-0.37
	(0.27)
R&D Competencies	0.49[**]
	(0.15)
Firm's activities diversification	0.85
	(0.54)
Dummy Age<3year	-0.88[**]
	(0.34)
Dummy Age<9year	-0.29
	(0.28)
Sector Dummies	*Included*
N	380
Log-pseudolikelihood	-546.395
Wald Chi2	87.92[**]
Pseudo R^2	0.04

Notes: Standard errors in parentheses: [+] $p < 0.1$, [*] $p < 0.05$, [**] $p < 0$.

---

[2] The incident rate for *Dummy breadth, 0 partner* is: $exp(\beta)=exp(-.991)=0.37$
[3] The incident rate for *Dummy breadth, 1-2 partner* is: $exp(\beta)=exp(-1.364)=0.26$
The incident rate for *Dummy breadth, 3-6 partner* is: $exp(\beta)=exp(-2.153)=0.12$

Figure 2. Predicted relationship between imitation and the depth of search through external sources
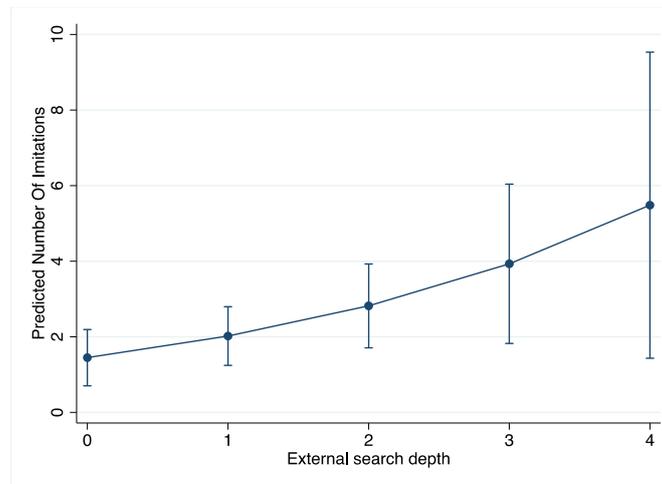
5. Discussion and conclusions

This study aims to expand our understanding of the competitive dynamics in knowledge-intensive industries with a lens on external search strategies and their role in shaping firms' imitation performance. In order to do so we sought to extend previous theories of imitation (information-based theories and rivalry-based theories) developing a concept of imitation search process.

The more recent literature on imitation has provided some evidences of the role of imitation as critical competitive strategy by which firms can increase their performance with respect to rivals (Shenkar, 2010). The seminal work by Lieberman and Asaba (2006) summarized some of these results with a peculiar attention to antecedents and performance implications of competitive imitation strategies. From these observations, it is clear that successful imitation requires information on rivals' action and diagnosis of the sources of competitive advantage (i.e. causal ambiguity, as well as resources and capabilities). In this perspective the observation of competitors is therefore fundamental determinant of imitation decision. Scholars have argued that collaborations are key vehicles through which firms obtain access to external knowledge (Ahuja, 2000). Two aspects of a collaboration structure are likely to be relevant in relation to the quantity and quality of information that can be transmitted (Kogut and Zander, 1992; Szulanski, 1996): the breadth, or variety, of the external set of collaborators and the depth, or intensity, of the content of the collaboration activities.

Our theoretical framework suggests that these two aspects (breath and depth) play different roles in the imitation process. According to this framework the breadth of the collaborators' network and the depth of these exchanges serve primarily as sources of information. But while the breath expands the diversity of information that the firm has access to and decreases imitation output, the depth influences the imitation output positively by improving firms' ability to use external sources. An increasing external search breadth provides access to information diversity while an increasing external search depth provides access both to information spillover and to resource sharing.

Interestingly enough this study offers a more in-depth explanation of the breath-effect and highlights a U-shaped relationship between breath and imitation. In particular we suggest that for too high levels of breath firms are more likely to imitate because they are no more able to effectively use the external sources of knowledge they have. Furthermore, we argue that an

increasing external search breadth requires that firms share their skills and their knowledge with multiple partners, which presume the existence of significant trust between them (Ahuja, 2000). Without trust and shared norms sharing knowledge can be difficult and unproductive as relationships can be threatened by opportunistic behaviors. For this reason in an increasing variety of the collaborators' network when the information circulates among many potential users, the alertness and responsiveness is likely to determine the benefit that firms obtain. Firms with many different collaborators are more constrained by their ability to absorb new information and respond to it as flexibly as firms with few different collaborators. Firms with many direct collaborators, being in the thick of things, are less likely to add to their knowledge or to absorb as much knowledge through indirect ties than are firms with few direct collaborators, which is likely to have an effect on the firms' adoption of new product or services opportunities. Moreover when firms have many connections the information that reaches the firms through the network also reach many others partners of its collaborators.

Also in this study we find that external search depth of the relationship has a positive impact on the imitation output. Although having much different collaborations can be detrimental, having an intense collaboration on a wider set of activities is beneficial. Involving each single partner in larger set of activities increases the firm ability to absorb their knowledge and information. Moreover the value of depth of external search is also determined by the possibility of building trustful partnership and depth is a mechanism that favors the development of hand-in-glove relationships.

This conclusion is likely to apply to the knowledge intensive firms that operate in complex environments and require tight-ties in order to effectively collaborate with external partners (Muller and Zenker, 2001). Communication and information sharing are integration mechanisms to coordinate inter-organizational relationships (Ring and Van De Ven 1992): the higher is the complexity of vertical inter-organizational relationships the more firms rely on communication and information sharing to learn from each-other and foster cross-firm learning and problem solving (Helper, MacDuffie and Sable, 2000).

Overall, our results corroborate the KIBS literature that emphasizes the relevance of external networks of partners (Love and Mansury, 2007) and move foreword the understanding of the relevance of such relationships: the variety of partners is crucial to successfully scan the external environment and affect KIBS firm's imitation strategy. Furthermore, we emphasize as KIBS business, which is complex, heterogeneous and uncertain, requires close partnerships to effectively share knowledge and information and, hence, the ability to select the most relevant collocutors to make investments with.

Finally this study calls for a contingent theory of external search strategy: what constitutes an enabling collaboration is likely to be related to the complexity of information that the firm has to manage and firms need a more in-depth understanding of the network and social structure that is most effective in each context. As Lieberman and Asaba (2006) argue, uncertainty is crucial in explaining firms' willingness to imitate: in this paper we move foreword their theory by arguing that uncertainty can be reduced by external partnerships and we design a framework viable for KIBS firms. More in general we believe that our framework, which combines breath and depth, can suit the need of small knowledge-intensive firms that operate in complex environments.

6. Limitations and avenues for future research

While this analysis examined different dimensions of the search strategies for new opportunities it did not investigate the optimal configuration for different levels of market uncertainty, and for different level of service complexity. For what it regards these types of

relationships it would be interesting to understand how the network of external search is able to dynamically anticipate innovation trajectories "mirroring" the architecture of innovation.

Moreover this analysis poses further questions on these external search strategies. The issue not addressed in this paper is the extent to which a single organization can achieve imitation and innovation simultaneously, or whether those goals are mutually exclusive. The question is akin to the challenge of pursuing ambidexterity (Tushman and O'Reilly, 1996).

Moreover the analysis on this large-scale database poses many questions that need a further investigation at a deeper level. This analysis could keep trace of the mechanism that underlie informal and formal relationships.

References

Ahuja, G. (2000). "Collaboration networks, structural holes, and innovation: A longitudinal study". *Administrative science quarterly*, 45(3): 425-455.

Amara, N., Landry, R. and Doloreux, D. (2009). "Patterns of innovation activities in knowledge-intensive business services". *The Service Industries Journal*, 29(4): 407-430.

Asaba, S., and Lieberman, M. B. (1999). "Why do firms behave similarly? A study on new product introductions in the Japanese soft-drink industry". *Academy of Management Proceedings*. Academy of Management, 1999: M1-M6.

Banerjee, A. V. (1992). "A simple model of herd behavior". *The Quarterly Journal of Economics*, 797-817.

Baum, J. A., and Singh, J. V. (1994). "Organizational niches and the dynamics of organizational founding". *Organization Science*, 5(4): 483-501.

Bettencourt, L. A., Ostrom, A. L., Brown, S. W., and Roundtree, R. I. (2002). "Client co-production in knowledge-intensive business services". *California Management Review*, 44: 100–28.

Bikhchandani, S., Hirshleifer, D., and Welch, I. (1992). "A theory of fads, fashion, custom, and cultural change as informational cascades". *Journal of political Economy*, 992-1026.

Bikhchandani, S., Hirshleifer, D., and Welch, I. (1998). "Learning from the behavior of others: Conformity, fads, and informational cascades". *The Journal of Economic Perspectives*, 12(3): 151-170.

Bowen, J., and Ford, R. C. (2002). "Managing service organizations: does having a "thing" make a difference?" *Journal of management*, 28(3): 447-469.

Brockner,. J. P., Siegel, J. P., Tyler, D. T., and Martin, C. (1997). "When trust matters: the moderating effect of outcome favorability". *Administrative Science Quarterly*, 42(3): 558–583.

Chang, M. H., and Harrington Jr, J. E. (2007). "Innovators, imitators, and the evolving architecture of problem-solving networks". *Organization Science*, 18(4): 648-666.

Chesbrough, H. W. (2011). "Bringing open innovation to services". *MIT Sloan Management Review*, 52(2): 85.

Cohen, W. M., and Levinthal, D. A. (1990). "Absorptive capacity: A new perspective on learning and innovation". *Administrative science quarterly*, 128-152.

Corrocher, N., Cusmano, L. and Morrison, A. (2009). "Modes of innovation in knowledge-intensive business services: evidence from Lombardy". *Journal of Evolutionary Economics*, 19: 173–196.

Csaszar, F. A., and Siggelkow, N. (2010). "How much to copy? Determinants of effective imitation breadth". *Organization Science*, 21(3): 661-676.

DiMaggio, P., and Powell, W. W. (1983). "The iron cage revisited: Collective rationality and institutional isomorphism in organizational fields". *American Sociological Review*, 48(2): 147-160.

Fagerberg, J., Mowery, D. C. and Nelson R. R. (2005). *The Oxford handbook of innovation*. Oxford university press.

Galunic, D. C., and Rodan, S. (1998). "Resource recombinations in the firm: Knowledge structures and the potential for Schumpeterian innovation". *Strategic Management Journal*, 1193-1201.

Gavetti, G., Levinthal, D. A., and Rivkin, J. W. (2005). "Strategy making in novel and complex worlds: The power of analogy". *Strategic Management Journal*, 26(8): 691-712.

Gilbert, R. J. and Lieberman, M. B. (1987). "Investment and Coordination in Oligopolistic Industries". *Rand Journal of Economics*, 18: 17-33.

Gimeno, J., and Woo, C. Y. (1996). "Hypercompetition in a multimarket environment: The role of strategic similarity and multimarket contact in competitive de-escalation". *Organization science*, 7(3): 322-341.

Glick, W. H., Huber, G. P., Miller, C. C., Doty, D. H., and Sutcliffe, K. M. (1990). "Studying changes in organizational design and effectiveness: retrospective event histories and periodic assessments". *Organization Science*, 1(3): 293–312.

Gnyawali, D. R., and Madhavan, R. (2001). "Cooperative network and competitive dynamics: A structural and embeddedness perspective". *Academy of Management Review*, 26(3): 431–445.

Gulati, R., Nohria, N. and Zaheer, A. (2000). "Strategic Networks". *Strategic Management Journal*, 21: 203-215.

Haunschild, P. R., and Miner, A. S. (1997). "Modes of inter-organizational imitation: The effects of outcome salience and uncertainty". *Administrative Science Quarterly*, 42; 472–500.

Helper, S., J. P. MacDuffie, C. Sabel. (2000). "Pragmatic collaborations: Advancing knowledge while controlling opportunism". *Industrial and Corporate Change,* 9(3) 443–488.

Hipp, C. and Grupp H. (2005). "Innovation in the service sector: the demand for service-specific innovation measurement concepts and typologies". *Research Policy*, 34: 517-535.

Kale, P., and Singh, H. (2007). "Building firm capabilities through learning: the role of the alliance learning process in alliance capability and firm-level alliance success". *Strategic Management Journal*, 28(10): 981-1000.

Katila, R., and Ahuja, G. (2002). "Something old, something new: A longitudinal study of search behavior and new product introduction". *Academy of management journal*, 45(6): 1183-1194.

Kumar, N., Stern, L. W., and Anderson, J. C. (1993). "Conducting interorganizational research using key informants". *Academy of Management Journal*, 36(6): 1633–1651.

Larsen, J. N. (2000). "Supplier-user interaction in knowledge-intensive business services: types of expertise and modes of organization". In Boden, M., and Miles, I., eds. *Services and the Knowledge-Based Economy*. London And New York: Continuum.

Laursen, K., and Salter, A. (2006). "Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms". *Strategic management journal*, 27(2): 131-150.

Levinthal, D. A. and March, J. G. (1993). "The myopia of learning". *Strategic management journal*, 14(S2): 95-112.

Lieberman, M. B., and Asaba, S. (2006). "Why do firms imitate each other?", *Academy of Management Review*, 31(2): 366-385.

Love, J.H. and Mansury, M.A. (2007). "External linkages, R&D and innovation performance in US business services". *Industry and Innovation*, 14(5): 477-496.

Maister, D. 1993. *Managing the professional firm*. New York: Free.

Mansury, M.A., and Love, J.H. (2008). "Innovation, productivity and growth in US business services: a firm-level analysis". *Technovation*, 28: 52-62.

Miles, I., 2005. Knowledge-intensive Business Services: Prospects And Policies. *Foresight*, 7(6): 39-63.

Miozzo, M., Desyllas, P., Lee, H. F., and Miles, I. (2016). "Innovation collaboration and appropriability by knowledge-intensive business services firms". *Research Policy*, 45(7): 1337-1351.

Muller, E. and Zenker A. (2001). "Business services as actors of knowledge transformation: the role of KIBS in regional and national innovation systems". *Research Policy*, 30(9): 1501–16.

Nahapiet, J., and Ghoshal, S. (1998). "Social capital, intellectual capital, and the organizational advantage". *Academy of management review*, 23(2): 242-266.

Nelson, R. R. W., Nelson, S. G., and Winter, S. G. (1982). *An evolutionary theory of economic change*. Cambridge, MA: Belknap.

Nutt, P. C. (1998). "How decision makers evaluate alternatives and the influence of complexity". *Management Science*, 44(8) 1148–1166.

Patel, P., and Pavitt, K. (1997). "The technological competencies of the world's largest firms: complex and path-dependent, but not much variety". *Research policy*, 26(2): 141-156.

Pina, K. and Tether, B. S. (2016). "Towards understanding variety in knowledge intensive business services by distinguishing their knowledge bases". *Research Policy*, 45(2): 401-413.

Podsakoff, P. M. and Organ, D. W. (1986). "Self-reports in organizational research: problems and prospects". *Journal of Management*, 12(4): 531–544.

Polanyi, M. (1966). The logic of tacit inference. *Philosophy*, 41(155): 1-18.

Porter, M. E. (1980). *Competitive strategy techniques for analyzing industries and competitors*. New York: Free Press.

Ring, P. S., A. H. Van de Ven. (1992). "Structuring cooperative relationships between organizations". *Strategic Management Journal*. 13(7) 483–498.

Rivkin, J. W. (2000). "Imitation of complex strategies". *Management science*, 46(6): 824-844.

Semadeni, M., and Anderson, B. S. (2010). "The follower's dilemma: Innovation and imitation in the professional services industry". *Academy of Management Journal*, 53(5): 1175-1193.

Soda, G., Zaheer, A., and Carlone, A. (2008). "Imitative behavior: Network antecedents and performance consequences". *Advances in Strategic Management*, 25: 531-60.

Strambach, S. (2001). "Innovation processes and the role of knowledge-intensive business services (KIBS)". In *Innovation Networks*, Physica-Verlag HD.

Stuart, T. E., and Podolny, J. M. (1996). "Local search and the evolution of technological capabilities". *Strategic Management Journal*, 17(S1): 21-38.

Tether, B.S., (2005). "Do services innovate (differently)? Insights from the European innobarometer survey". *Industry and Innovation*, 12(2): 153–184.

Therrien P., Doloreux D. and Chamberlin T., (2011). "Innovation novelty and (commercial) performance in the service sector: A Canadian firm-level analysis". *Technovation* 3: 655–665.

Tushman, M. L., and O'Reilly, C. A. 1996. The ambidextrous organizations: Managing evolutionary and revolutionary change. *California management review*, 38(4): 8-30.

Unioncamere (2005). *Rapporto Unioncamere 2005 (Unioncamere Report 2005)*. Milano: Franco Angeli.

Unioncamere (2008). *Rapporto Unioncamere 2008 (Unioncamere Report 2008)*. Milano: Franco Angeli.

Unioncamere (2010). *Rapporto Unioncamere 2010 (Unioncamere Report 2010)*. Milano: Franco Angeli.

Uzzi, B. (1996). "The sources and consequences of embeddedness for the economic performance of organizations: The network effect". *American sociological review*, 674-698.

Biographical sketch

Stefano Li Pira is Assistant Professor at the Warwick Business School, University of Warwick, UK. His research interests are in strategic management, in competitive dynamics in technological intensive industry and in experimental work on the mechanisms of bargaining.

Anna Cabigiosu, Assistant Professor at the Department of Management, Ca' Foscari University, Venice, Italy and at IOS research center. Her research interests include innovation management, the management of complex systems, corporate strategy and the management of KIBS.

Diego Campagnolo, Associate Professor at the Department of Economics and Management, Padova University, Italy, and at CUOA and ICRIOS. His research interests include the evolution of production systems and the emerging organizational forms, the strategy of SMEs and the management of KIBS.

Appendix 1 - Variables, questions and scale

Variables	Scale and description	Questions
Number of imitations	Count variable. The variable is the number of product and process imitations introduced by the KIBS firm in the last three years	- How many product innovations new to the firm did you introduce in the last three years? - How many process innovations new to the firm did you introduce in the last three years?
External search breath	0-8 scale The variable counts how many different partners each KIBS firm has. The questionnaire identifies 8 categories of partners. Each category takes the value "1" when the KIBS firm answers "yes", and "0" otherwise. The value of the variable is the sum of the answers "yes" given by the KIBS firm for each category.	Who are the main partners of your network? (Yes/no) - Consultants (Design, marketing and communication) - Consultants (ICT) - Engineering office, laboratories, test centers - Consultants: Professional services - Government offices - University and other research institutes - Scientific parks - Others (Craftsmen, freelancer, accountants, lawyers…)
External search depth	0-4 scale This variable counts the areas of exchange with external partners. The questionnaire identifies 4 areas. Each area takes the value "1" when the KIBS firm answers "yes", and "0" otherwise. The value of the variable is the sum of the answers "yes" given by the KIBS firm for each area.	Which type of collaborations do you have with external partners? (Yes/no) - Exchange of personnel - Sharing of technological solutions - Sharing of commercial solutions (clients, markets) - Creation of new products/processes
Number of collaborators	0-1 Scale This variable counts the number of collaborators of the firm. In the questionnaire the respondent has to specify the number of collaboration in 5 geographical areas (Regional, National, EU, Continental, World). We summed the value of the 5 independent variable and we normalized the value in a range between 0 and 1 (maximum level of collaboration in the sample)	How many collaborators do you have at each level? (Indicate the number of collaborators) - Veneto - Italy (except Veneto) - EU (except Italy) - Europe (except EU) - World (except Europe)
Client search breath	0-4 scale. We measured the median level of each of the four items on the right used to assess the breath of collaboration with clients. We assigned the value "1" for scores higher than the median, "0" otherwise. Then we obtained the overall level of breath by summing the value obtained for each of the four items.	Use a 1 (not important) -5 (highly important) scale to assess the relevance of clients as a source of learning in the following areas: - Technological research and improvement of competences; - New product development; - Improvement in the production process (inner efficiency); - Entrance in new markets, segments
Client search depth	0-3 scale We measured the median level of each of the three items on the right used to assess the depth of collaboration with clients. We assigned the value "1" for scores higher than the median, "0" otherwise. Then we obtained the overall level of depth by summing the value obtained for each of the four items.	Use a 1 (never)-5 (always) scale to answer to the following question: how frequently the following sentences reflect your relationship with clients? - Clients have a unique and dedicated referent within the firm - Clients have multiple referents within the firm - Clients have a web platform to interact with the firm
R&D competencies	Count variable. The variable is the number of product and process innovations introduced by the KIBS firm in the last three years	- How many product innovations new to the industry did you introduce in the last three years? - How many process innovations new to the industry did you introduce in the last three years?
Dummy Age<3 year	0-1 This variable is a dummy variable equal to "1" if the firm has been established in the last three years.	In which year did you establish your firm?

Dummy Age>9 year	0-1 This variable is a dummy variable equal to "1" if the firm has been established more than nine years ago.	In which year did you establish your firm?
Percentage of graduate employee at year 2008	Percentage (0-100%) This variable measures the percentage of employees with a title equal or higher than the bachelor degree.	Which is the percentage of your employees that has a PhD, a master or a bachelor degree?
Number of employees in 2008	Continuous variable This variable counts the number of employees.	How many employees do you have?
Firm's activities diversification	Sum of squares of the percentage of total sales across all firm's activities.	Which are the areas of specialization of the firm and how much do they contribute in terms of sales?