## ARE ALL INNOVATIONS EQUALLY PERFORMING? THE CASE OF ITALIAN KIBS FIRMS

#### ABSTRACT

In this paper we argue that service innovation is a multifaceted concept but existing studies do not fully account for the effect of different types of innovation on a firm's performances. Coherently, we consider different types of innovation on the basis of their *content* and *degree of novelty*, distinguishing between product and process innovations new to the industry and new to the firm respectively. Differently from prior research, we develop our hypotheses on how innovations with different contents and degrees of novelty simultaneously relate to growth and productivity. We tested our hypotheses on a sample of 99 Italian KIBS firms. Results support the idea that highly innovative product innovations are more strongly associated with a KIBS firm's growth, while weakly innovative process innovations are more strongly associated with a KIBS firm's productivity, but only in small firms. Theoretical and managerial implications are drawn.

Keywords: service innovation, performance, KIBS

#### **INTRODUCTION**

It has been well documented that services play a prominent role in the economy of developed countries, accounting for more than 70% of the GDP across OECD members (OECD, 2011). Within the service sector, the specific category of knowledge-intensive business services (KIBS) has growth steadily and now amounts to 21% of the total value added in the OECD area (up from 18% in 1999) (OECD, 2001; OECD, 2007). Researchers have demonstrated that one of the key variable explaining KIBS growth is innovation (Cainelli, Evangelista and Savona, 2003; Evangelista and Savona, 2003; Loof and Heshmati, 2006; Van der Wiel, 2001; Van Leeuwen and Van der Wiel, 2003). In this paper we develop original hypotheses about the performance

implications of innovation in KIBS. Particularly we advance the KIBS literature by postulating that innovation is a multifaceted concept and that different typologies of innovations exist in KIBS that

As a matter of fact, we cannot consider all innovations as equally beneficial on a firms' performance. Specifically, the degree of novelty and the content of innovations represent two criteria often used alternatively to distinguish among different types of innovations in KIBS. Innovations in services, as well as in products, range from innovations that are new to the entire industry and innovations that are new solely to the firm (Mansury and Love, 2008; Therrien et al., 2011). As far as the content of innovation is concerned, innovations may involve the product, i.e. the content of a service, or the process, i.e. the way a service is designed and delivered (Damanpour, Walker and Avellaneda, 2009). So far the KIBS literature has analyzed how innovation content *or* novelty affect firm performance but has not looked at how innovations have different effects over performance as well as innovations with different levels of novelty. Hence it is relevant to build a more comprehensive framework that contemporarily considers multiple attributes of innovations and their performance implications (Campagnolo and Cabigiosu, 2015; Mansury and Love, 2008; Therrien et al., 2011).

may diversely affect their performance.

Overall, the question of toward which directions should service firms address their investments in innovation remain substantially unanswered. Enhancing our knowledge on the relationship between different innovation types and performance in KIBS is the primary objective of this paper. We develop a theoretical model on how different types innovations characterized by different degrees of novelty influence a firm's performance and test it on a sample of 99 Italian KIBS firms. Our results confirm that different types of service innovation and innovations with different degrees of newness are variously associated with a KIBS firm's performance. More specifically, results of regression analysis support the hypothesis that product innovations with a higher degree of novelty more positively affect the growth of the service firm. Conversely, process

We believe that this study contributes to the literature on service innovation in KIBS firms by expanding our understanding of how different innovation types affect a firms' performance. In fact, we show that behind an overall positive relationship usually assumed by established literature, there is a complex and multifaceted relationship between innovation and a KIBS firm's performance. By demonstrating that not all innovations are equal, our study confirms that, in innovation research, it is essential specifying the content and degree of novelty of the innovation in order to provide generalizable results.

innovations with a lower degree of novelty more positively affect KIBS firms productivity.

Our study offers further managerial insights for practitioners. Since innovations show different effects on performance and the nature of change associated with different types of innovations are different, our results imply that not all innovations are equally beneficial on a firm's performances. Thus managers should carefully match their innovation efforts with the objective they are aimed to pursue when designing the innovation plan of their firms.

The paper is arranged as follows. In the next section we describe the theoretical grounds of our research question and develop the corresponding hypotheses. In the "Data and Method" section, we describe the research domain and sample; next we illustrate how we operationalized the constructs. The results are then reported and discussed. In the last section, we summarize the most relevant findings and our conclusions, followed by comments on the study's limitations and future research directions.

#### **THEORY DEVELOPMENT**

#### **Innovation and performance in KIBS**

Innovation in KIBS firms has been studied from various perspectives, one of which (and the most often studied) is how KIBS firms develop new services (Strambach, 2001). Research findings indicate that innovation processes in KIBS are triggered by their clients' requirements (Hipp and

Grupp, 2005; Larsen, 2000; Päällysaho, 2008; Tether and Metcalfe, 2004). In other words, innovation in KIBS is fed by a client's needs and implemented through recursive loops of client-supplier interaction, and knowledge and information sharing (den Hertog, van der Aa and de Jong, 2010). Hence innovation capabilities are crucial for KIBS firms to accomplish clients' need and for their competitive advantage. Innovation in KIBS fosters KIBSs' growth and that of their clients as well.

Building on these arguments, scholars have focused on the effect that innovations have on KIBSs' growth and productivity with somehow contrasting results. Cainelli et al. (2004; 2006) analyze an Italian region, the Lombardy, and found that innovative KIBS firms grow more and are more productive than non-innovative KIBS (Cainelli et al., 2004). Innovative KIBS firms have more resources to devote to innovation and are able to generate a self-reinforcing and persistent positive loop between innovation and performance (Cainelli et al., 2006). Love et al. (2011) analyze UK KIBS firms and find a positive relationship between innovation and sales growth. Evangelista and Savona (2003) find that those service firms that invest more in innovation are more likely to grow.

Mansury and Love (2008) analyze a sample of business to business US service firms. They find a positive relationship between innovation and growth but not between innovation and productivity. The authors suggest that new services may disrupt pre-existing procedures thus reducing productivity in the short term. Alternatively, newly introduced products may initially be produced through scarcely efficient production processes, which negatively impact on productivity. Later on, once the production process is settled, process innovations are likely to positively affect efficiency.

Overall, the mainstream KIBS literature does support the existence of a positive relationship between service innovation and growth. Again, most of the empirical contributes show a positive effect of service innovation on productivity. Taking for granted that innovation increases KIBS firms' performance, which innovations better explain firms' growth and productivity? Some contributes tried to account for the heterogeneity of KIBS firms' innovative effort distinguishing mainly on the basis of the types of innovations (product vs process innovations) or on the market-based novelty of innovations (innovations new to the firm vs innovations new to the industry).

As far as the content of innovation is concerned, literature about innovation in the manufacturing industry converges on the idea that growth may be achieved by introducing both new products and processes. A product innovation is a new product or service offered to customers to satisfy their needs. A process innovation is a new mode of production and delivery of the good or service introduced into an organization's production or service operations (Barras, 1986; Damanpour and Gopalakrishnan, 2001; Utterback and Abernathy, 1975). Product innovations have a market focus and are primarily customer driven, while process innovations have an internal focus and are primarily efficiency driven (Damanpour, Walker and Avellaneda, 2009; Utterback and Abernathy, 1975). New products provide firms the momentum for market share and hence sales growth by increasing the customer base in current markets or attracting new customers by opening new markets to the firm (Goedhuysa and Veugelersb, 2012; Iansiti 1995; Wolf and Pett, 2006; Zahra and Nielsen 2002). Process innovation has a double effect. Process innovation mainly improves firms' productivity and their ability to benefit from the resources they possess. In the long run process of their products (Wolf and Pett, 2006).

Differently from manufacturing, the service literature is more cautious in distinguishing between product and process innovations because they may be not clearly separable (Evangelista and Savona, 1998; Gallouj, 2002; Miles 1995; Tidd, Bessant and Pavitt, 2005). Nonetheless, some authors argue that drawing the distinction between product and process innovations in service firms as well as in KIBS firms is feasible and relevant (Damanpour et al. 2009; Hipp and Grupp, 2005; Sirilli and Evangelista, 1998). This literature has mostly emphasized that clients drive product

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innovations processes and that KIBS firms' ability to develop new services determines their growth (Den Hertdog, 2000). Nevertheless, we still lack quantitative tests of this hypothesis. The limited empirical evidence on KIBS suggests that only process innovations improve firm's productivity while both product and process innovations may enhance firm's growth (Campagnolo and Cabigiosu, 2015).

As far as the market-based novelty of innovations is concerned, the distinction between innovations new to the industry and new to the firm disentangles innovations on the basis of firms' timing of entry<sup>1</sup>. The strategic management literature has widely debated the advantage of first movers. First, or early mover, advantage may lead to superior performance thanks to the firm's technological leadership, the pre-emption of scarce resources, and the buyer switching costs (Roberts and Amit, 2003; Lieberman and Montgomery, 1988). But the literature also warned about the risks that first movers face (substantial investment for product development, undeveloped supply and distribution channels, immature enabling technologies and complements, uncertainty of customer requirements) (Suarez and Lanzolla, 2006). Focusing on KIBS, Therrien et al. (2011) find that new to the industry services guarantee the highest increase in sales, no matter how much original they are. Mansury and Love (2008), studying business to business services and among them several KIBS, find that both types of innovation positively impact on firms' growth. No effect on productivity is detected.

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Insert Table 1 about here

<sup>&</sup>lt;sup>1</sup> The distinction between radical and incremental innovation is considered less relevant in services because focused on the technological content of innovation while in services often processes and procedures play a central role and innovation is at the organizational level. Hence, several surveys and studies distinguish the innovative content of services on the basis of the firm's timing of entry (Therrien et al., 2011; Love and Mansury, 2007).

In this paper we argue that it is relevant distinguishing among different types of innovations since existing empirical evidence shows that they may diversely affect KIBS's growth and productivity (see Table 1). Furthermore, a better understanding on the relationship between innovation and KIBS firms performances have also clear managerial implications, permitting more informed decisions on how to allocate resources and on which types of innovation investing. Despite the relevance of the topic, we still lack studies that analyse the impact of product and process innovations over KIBS firms' performance taking into account their market-based-novelty, i.e. product innovation new to the firm, product innovations new to the industry, process innovations new to the firm and process innovations new to the industry. We believe that the effect of product and process innovations on a firm's growth and productivity may be better understood if we also consider the timing of entry of KIBS firms. In fact, the market-based novelty may amplify or hinder the effects of different types of innovation on a KIBS firm's performance. For example, in services product innovations and innovations new to the industry are both expected to increase a firm's market share but innovations new to the industry may also have disruptive effects or display higher switching costs (Mansury and Love, 2008; Therrien, et al. 2011). Their combined effect over KIBS's performance has never been debated.

The next paragraphs discuss how market novelty of product and process innovations affects firm's growth and productivity and develop original hypotheses.

## How market novelty of product and process innovations affects KIBS firm's performance

Following the mainstream manufacturing and service literature, product innovation is mainly aimed at increasing market share. Also the KIBS literature supports the view that product innovations increase a firm's market share in line with the characteristics of the innovation process in KIBS firms. In fact, KIBS firms develop new services when triggered by clients (Love and Mansury, 2007). KIBS are knowledge intensive and specialized firms expected to solve clients' issues eventually developing new solutions. A KIBS firm capable of introducing (product) innovations to serve specific clients' requirements is likely to experience positive returns on its market share because it gains a reputation for being customer-oriented and flexible (Cabigiosu et al., 2015; Skjølsvik et al., 2007). KIBS firms often develop new services based on the knowledge they acquire by collaborating with clients during service development and delivery (den Hertog, van der Aa and de Jong, 2010; Hipp and Grupp, 2005; Larsen, 2000; Tether and Metcalfe, 2004). When KIBS firms interact with customers, they have the chance to exchange significant amounts of data and information with clients about their needs and industries, and thus identify new business opportunities. Collaboration with clients drives a firm's ability to successfully innovate identifying new services to satisfy clients' requirements (Campagnolo and Cabigiosu, 2015). Hence, the characteristics of the innovation process in KIBS reduce the market uncertainty from the demand side: KIBS have tight relationships with clients and they have an in-depth understanding of their needs.

Differently from Therrien et al. (2011), who point out that new to the industry innovations are often more disruptive than new to the firm innovations, we also claim that in KIBS first movers have a competitive advantage over late movers. As a matter of fact, innovating KIBS do not face all the risks and uncertainty that typically hinder first-movers advantage. First, KIBS firms have a better understanding of clients' needs and of the market share for these services since they collaborate with clients when developing new services. KIBS firms come in the organizational and operational processes of their clients, and their services are frequently the outcome of a joint effort between the service provider and the client, via an intense knowledge sharing between the parties (den Hertog, 2000). Second, KIBS often develop new services by collaborating with established networks of partners, such as other KIBS firms, Universities, research centres, public institutions, consultants, that support and foster KIBS innovation processes. This is especially true for the smallest KIBS firms that innovate 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). As Chesbrough (2011) explained, open innovation in knowledge-intensive services can deliver better economics for KIBS firms as well as better products and better services for the business's clients.

We suggest that KIBS firms launching new products may benefit from being first movers and be recognized as market leaders. KIBS firms can acquire new loyal clients and increase their market shares. Also followers may benefit from product innovations but comparatively less because they do not have the same ability and reputation of first mover innovators. Manufacturing firms that have new needs to satisfy, or require new solutions to satisfy their needs, will prefer KIBS firms that have the reputation of being able to explore new solutions and develop new services. Furthermore, network externalities and clients switching costs may reinforce the advantage of first movers.

Overall, drawing from the above discussion our first hypothesis follows:

H1. In KIBS firms, the positive relationship between innovation and sales' growth is stronger for product innovations new to the industry than for other combinations of types of innovation and novelty.

While product innovations aim at increasing a firm's market share by offering new services, the primary focus of process innovations for KIBS firms is to be more competitive from the cost side by improving a firm's efficiency (Garcia and Calantone, 2002; Sirilli and Evangelista, 1998). Hence, process innovations are mainly inward looking and are aimed at fostering a KIBS firm's productivity. Therefore, KIBS firms may opt for a wait and see strategy and introduce only those process innovations on which know how and experience have already been accumulated at the industry level. Other things being equal, when KIBS firms introduce new to the firm processes they can select those innovations that generate the highest savings. Relying on a wait and see strategy KIBS firms can imitate competitors by exploiting their prior experience. Process innovations new to the industry, by definitions, are activities never performed in their present operational mode, on which suppliers and employees are not familiar with. In contrast, process innovations new to the firm benefit from higher learning effects<sup>2</sup> as they are introduced and/or performed with the help of experienced suppliers, consultants and workmen.

Again, if innovations involve the service delivery process, innovations new to the firm may have higher chances to be accepted by clients that may have experienced similar procedures in the past collaborating with other suppliers. In fact, since process innovations are mainly aimed at increasing KIBS firms' performance, clients may not be willing to accept changes in the delivery process unless they are already familiar with these procedures and/or have tangible benefits. Clients foster product innovations in KIBS but they may be less willing to "experiment" KIBS's process innovations.

Overall, when process innovations are concerned, a wait and see approach is likely to be more appropriate for KIBS firms. Hence our second hypothesis follows:

H2. In KIBS firms, the positive relationship between innovation and productivity is stronger for process innovations new to the firm than other combinations of types of innovation and novelty.

#### **DATA AND METHOD**

#### Data and research method

We generated our dataset in two steps. First, we collected part of our dataset, i.e. independent variables, through a survey on KIBS firms. Second, we collected the remaining data, i.e. dependent variables, by consulting the AIDA database, which provides (among others) detailed accounts, indicators and trade descriptions of more than 1 million Italian companies. Overall, our dataset comprises the period 2006-2009 and specifically covers the period 2006-2008 for the

 $<sup>^2</sup>$  Market based novelty does not give information on how much different the new procedures/processes, and the related competences, are from pre-existing services. Thus, other things being equal, market based novelty can be considered as a proxy for the experience accumulated, at the industry level, on specific service processes and the related complements and enabling technologies.

independent variables and the period 2007-2009 for the dependent variables. Thus, we left 1 year time lag between independent and dependent variables to possibly mitigate the risk of endogeneity.

Our data refer to KIBS firms of the Veneto region (North-east of 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 2009, 7,049 KIBS firms were based 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 in 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%), but only 238 companies returned fully-completed questionnaires.

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 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., 2004). The questionnaire contains sections on the firm's data, market strategies, entrepreneurship, organization, networking activities, service configurations and innovation. The questions/items for the purpose of this study are described in the "Measures" section. 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 firms analyzed had an average of 7 employees each with a standard deviation of 7 and a maximum of 44 employees). We did not explain the object of our research to respondents in order not to influence them ex-ante.

Once we matched our survey on KIBS firms with the data we obtained from the AIDA database, we remained with 99 observations. As a matter of fact, the AIDA database contains only data on companies with limited liability and KIBS firms do not frequently adopt this corporate form. Although the number of valid observations largely reduced, the merge of two independent databases prevented from possible common method variance issues, perceptual biases and intentional distortions, since dependent and independent variables come from two distinct sources (Huber and Power, 1985; Podsakoff and Organ, 1986). Overall, we obtained complete information on 99 valid observations when the dependent variable is *Sales growth*, and 85 valid observations when the dependent variable is *Sales growth*.

#### Measures

#### Independent variables

The independent variables considered were: *Product innovations new to the firm, Product innovations new to the industry, Process innovations new to the firm, Process innovations new to the industry.* 

We measured the variables *Product innovations new to the firm, Product innovations new to the industry, Process innovations new to the firm* and *Process innovations new to the industry* as, respectively, the number of each type of innovation introduced by the firm in the period 2006-2008 (Cainelli et al. 2006; Hipp et al., 2000; Tether et al., 2004; Mansury and Love, 2008; Therrien et al., 2011).

#### **Dependent variables and controls**

The dependent variable for H1 is *Sales growth* while the dependent variable for H2 is *Sales per employees growth*. We measured these variables as the percentage of growth in the period 2007-2009.

Sales growth and Sales per employees growth might differ across firms for several reasons. Based on the KIBS literature, we tested our hypotheses with three control variables - i.e. *firm size* (measured as firm's revenue in millions of Euro), *firm age* (the difference between the year of the survey and the year in which the firm was established), *graduates* (the percentage of firm's employees with a university degree or higher education) and with three dummies *external collaborations* (a dummy variable equals to 1 whether the firm collaborates with other firms either for the development or delivery of services), *ICT* and *Professional*, representing two out of the three service typologies in our sample (ICT, professional and design firms).

#### **TESTS AND FINDINGS**

Tables 2 and 3 respectively contain the descriptive statistics and the correlation matrix for all the variables. Table 2 also shows the number of firms in our sample belonging to Professional (49), ICT (40) and Design firms (10).

Insert Table 2 about here Insert Table 3 about here

To begin with, we tested H1 using an ordinary least squares (OLS) model (with robust std errors) in which the dependent variable is *Sales growth* and the independent variables are *Product* 

*innovations new to the firm, Product innovations new to the industry, Process innovations new to the firm* and *Process innovations new to the industry*. The model also includes the three controls and the three dummies described in the previous sections (see Table 4).

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Insert Table 4 about here

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*Product innovations new to the industry* is the unique independent variable with a coefficient positive and significant thus supporting H1 (see Table 4, column 2).

Then, we performed an OLS model (with robust std errors) in which the dependent variable is Sales per employee growth and the main independent variables are Product innovations new to the firm, Product innovations new to the industry, Process innovations new to the firm and Process innovations new to the industry. No independent variable is significant and only the control firm size is positive and significant suggesting that the bigger the firm the higher the productivity increase (see Table 4 column 3). Interestingly, the managerial literature has analyzed the interplay between firm size, innovation and performance claiming that firm size may affect the relationship between innovation and growth. Some authors suggest that the size has a positive effect on performance and also on innovation because the biggest firms usually have more resources to invest in innovation (Damanpour, 2010, 1992; Kimberly and Evanisko, 1981). Large firms may benefit more from investing in process innovations because a new process that reduces costs yields larger total savings to the company producing a large volume of output than to the firm whose output is smaller (Scherer, 1980; Cabagnols and Le Bas, 2002; Cohen and Klepper, 1996). Jiménez-Jiménez and Sanz-Valle (2011) find that the relationship between innovation and performance is stronger when firms are bigger. However, they also suggest that small firms may benefit more from process innovation because they need to more carefully manage their resources.

Hence, we controlled if the effect of *Process innovations new to the firm* over *Sales per employee growth* was affected by *firm size*. We run our OLS model also including the interaction variables between *Process innovations new to the firm x firm size* and for completeness we also include the interaction effects *Process innovations new to the industry x firm size*, *Product innovations new to the industry x firm size* and *Product innovations new to the firm x firm size* (see Table 4 column 4). As the literature recommends, we centered the variables on their means before creating the interaction terms (e.g., Cronbach, 1987). Interestingly enough introducing the interaction variables *Process innovations new to the firm size* is negative and significant, the interaction *Process innovations new to the firm x firm size* is negative and significant while *firm size* is no more significant. These results suggest that *Process innovations new to the firm* is positively associated with a firm's productivity only for small firms.

To gain further evidence we plot the interaction effect of *firm size* over the relationship between *Process innovations new to the firm* and *Sales per employee growth* (see Figure 1). The Figure shows that the effect of *Process innovations new to the firm* over *Sales per employee growth* changes sign with the size of the firm. *Process innovations new to the firm* has a positive effect on *Sales per employee growth* when the KIBS is small and a negative effect for bigger firms.

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Insert Figure 1 about here

Finally we performed two OLS models, one for KIBS firms smaller than the median and one for firms bigger than the median (300,000 euros), in which the dependent variable is *Sales per employee growth* and the independent variables are *Product innovations new to the firm, Product innovations new to the industry, Process innovations new to the firm* and *Process innovations new to the industry.* The results show that the only positive significant independent variable is *Process innovations new to the firm* for firms smaller than the median (see column 2). *Process innovations new to the firm* becomes negative and significant for firms bigger than the median (see column 3).

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Insert Table 5 about here

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In all regression models, the VIF test suggests that the models do not present multicollinearity issues<sup>3</sup>.

#### DISCUSSION

In this paper we aimed at investigating the relationship between different types of innovations and firm's performances in KIBS firms. The majority of the literature on innovation has developed in the manufacturing sector and only partially in the business service sector, with even lower attention to the KIBS segment. The latter is indeed peculiar from the innovation process point of view as the KIBS literature highlighted with reference to the role of customers as driver of the innovation process itself (Gallouj, 2002; Miles, 2005). Starting from the assumption that in services, as well as for tangible products, the distinction between product and process innovation is feasible (Hipp and Grupp, 2005; Sirilli and Evangelista, 1998), in the theory development section we pointed out that a deeper understanding of the link between different types of innovation and a firm's performance is useful. As a matter of fact, this subject has not yet reached conclusive results and deserves further investigation. One of the possible streams of development is the combination of different types of innovations that, albeit related, has been treated separately so far (Damanpour, 2010). We developed our hypotheses taking into consideration simultaneously different types of innovations both on the basis of their content (i.e. the distinction between product and process innovations) and on the basis of their market-based novelty (i.e. the distinction between innovations new to the industry and innovation new to the firm). Product innovations address growth objectives, while process innovations are focused on productivity improvements (Damanpour et al, 2009,

<sup>&</sup>lt;sup>3</sup> VIF shows how much of the variance of the coefficient estimate is being inflated by multi-collinearity. A VIF greater than 10 is considered to signal harmful multi-collinearity (Greene, 2000). Our VIFs always show values lower than 3.74.

Fritsch and Meschede, 2001, Utterback and Abernathy, 1975). Thus, in services as well as in products, product innovations are expected to be positively related to sales growth while process innovations are expected to be positively related to better productivity (Mansury and Love, 2008). However, the interaction between innovations and market-based novelty in KIBS is likely to be different from what occurs in the manufacturing sector (Therrien et al., 2011). In the latter case, research has demonstrated that introducing disruptive innovations (i.e. innovations new to the industry) may be riskier than introducing innovations with a lower degree of novelty (i.e. innovations new to the firm) especially when the market is not yet ready or whether the new product destroys consolidated procedures and competences (Suarez and Lanzolla, 2006). On the contrary, in the KIBS firms domain, the role of clients as trigger of KIBS' innovation processes and the tight knowledge transfer that usually occurs between the KIBS firm and its clients before, during and after the introduction of a new service, counter the risks associated with highly innovative services. Therefore, KIBS firms are likely to experience positive returns from the introduction of highly innovative services either because their innovations match market share.

Concerning process innovations, market-based novelty is likely to behave differently from the case of product innovations as process innovations are aimed at increasing a KIBS firm's productivity. Since process innovation concerns the production and delivery of services, in order to prevent possible disruptive effects at the client's operations level, KIBS firms are better off introducing innovations already in the market, i.e. innovations new to the firm. In so doing, they can leverage on the experience already accumulated in the market. Therefore, we hypothesized that process innovations new to the firm have a stronger relationship with a KIBS firm productivity than process innovations new to the industry.

Results confirm the general assumption of our work, i.e. that the relationship between service innovation and performance is complex and multifaceted. Generally affirming that innovation is positive for service firms is superficial and potentially misleading. Therefore a comprehensive theory on service innovation needs to deeply investigate all possible angles of service innovation to get conclusive results of its effect on a firm's performance.

Specifically, not all combinations of innovation's contents (product and process innovations) and market-based novelty (new to the industry and new to the firm innovations) have a significant (positive) effect on a firm's performance. It is confirmed that: a) product innovations are positively related to KIBS firm sales' growth in line with mainstream literature (Cainelli et al, 2004, 2006; Evangelista e Savona, 2003; Mansury and Love, 2008) and b) process innovations are positively related to KIBS firm productivity growth in terms of sales per employees in line with part of the literature on the subject (Campagnolo and Cabigiosu, 2015). Contemporarily, results confirm no statistically significant relationship between product innovations and KIBS firm productivity, as well as between process innovations and KIBS firm growth.

Our hypotheses are substantially confirmed: product innovations new to the industry are more strongly associated with a KIBS firm growth than product innovations new to the firm. Again, process innovations new to the firm are more strongly associated with a KIBS firm productivity than process innovations new to the industry, even if this result holds only when introducing the moderating role of firm size. These results highlight that the distinction among innovations on the basis of their timing of entry (or market novelty) is relevant and that they behave partially different from innovations in the manufacturing industry (Therrien et al, 2011). The introduction of new to the industry product innovations is beneficial for KIBS firm, while introducing product innovations only new to the firm would have no effect in terms of growth. Even if we cannot demonstrate that this positive effect is related to the relationship KIBS firms develop with clients, it is highly presumable. Indeed, KIBS firms gain several information on clients' needs and operations by working closely with them, which in turn can possibly translate into valuable market research information and, eventually, new products. In other words, KIBS firms that operate as first movers experience positive results on growth.

As far as process innovations are concerned, it is worth underlying that the positive relationship of

process innovations new to the firm with the growth of KIBS firms' productivity depends on firm's size, which negatively moderates the above relationship. This suggests that the smaller the firm, the stronger the relationship between process innovations new to the firm and productivity improvement. Conversely, for larger firms, the relationship turns negative since the coefficient of the moderating term is even larger than the coefficient of the direct relationship itself. This result is particularly interesting since it questions established literature that assumes that firm's size is more positively associated with process innovation than product innovations (Cohen and Levin, 1989; Fritsch and Meschede, 2001; Scherer, 1980 Jiménez-Jiménezand Sanz-Valle, 2011). Our results offer an alternative view where small KIBS firms, differently from large KIBS firms, are likely to benefit from productivity growth "coping" the process innovations that are already present in the market and that permit higher revenues per employees with lower investments. For example, process innovations such as the introduction of ICT-based tools or software, increase the automation of service production and delivery, and in turn the efficiency of the firm. On the contrary, the larger the firm introducing new to the firm process innovations the lower the productivity enhancement it obtains. In fact, larger firms might be characterized by rigid structures and formal procedures where resistance to change and inertia are more frequent than in smaller firms. Moreover, when introducing innovations that already exist in the market, large (successful) firms could more easily suffer from a Not Invented Here (NIH) syndrome, which creates a less favourable environment for an outside-in approach to innovation. Thus, large firms might be forced to compromise with established routines, and could risk damaging the outcome of the entire process of change. Overall, even if large firms are usually equipped with more resources to devote to innovation compared to small firms, they might require higher investments in the short term, which in turn prevent from "immediate" productivity benefits.

Ultimately, the theoretical contribution of our work is twofold. First, it sheds further lights on the opportunity to integrate the analysis of the relationship between innovation and performance. Specifically it shows that not only different types of innovations are relevant but also the combination of different types of innovation is a fundamental aspect to deal with to gain generalizable insights. Second, our work contributes to the development of a service innovation theory of KIBS warning about possible differences across different service domains, even if understanding the role of the peculiarities of the innovation process in KIBS on the relationship between innovation and performance was beyond the scope of our research question.

Our work has also clear managerial implications since results contribute to clarify the role of innovation towards better performances either in terms of growth or in terms of productivity. Investing in innovation is fundamental for KIBS firms but having a thorough understanding of their outcomes can better drive firms' choices regarding *where* and *when* innovating. A firm should consider simultaneously whether innovating the product or the process and whether being a *first mover* or a *follower* in terms of novelty. Indeed, our results suggest that these choices are not independent among each other as far as the relationship with KIBS firms performance is concerned. Again, managers should seriously consider the combination of product *innovation* and process *imitation* strategies in order to positively affect the overall performances of their firms.

#### **CONCLUSIONS AND FUTURE DEVELOPMENTS**

Even if this paper has the merit to extend existing knowledge about the complex relationships between innovation and performance in KIBS, demonstrating that not all innovations are equally beneficial and that not all innovations have comparable results on different performance indicators, it has also a number of limitations that represent opportunities for future research. First, our results refer to a region of Italy where KIBS are micro firms which mean dimension is smaller than that reported in previous studies about innovation and performance in KIBS (Therrien et al., 2011; Mansury and Love, 2008). Therefore our results might be affected by the setting selected.

Second, our results highlight the controversial role of firm size on productivity. A deeper analysis comparing KIBS firms of different size is advisable.

Third, the use of regression analysis better highlighted the correlation that exist between each single dependent variable about innovation and KIBS firm performances, but further research could investigate more how different types of innovation interact among each other. Put differently, instead of assuming that product and process innovations are autonomous and each is motivated by a different set of drivers, future research is advised to examine the interrelationship between innovation types and the consequence of their concurrent generation or adoption.

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## TABLE 1.

Innovation and performance in KIBS: the quantitative evidence available

	Effects on growth	Effects on productivity
Innovation	Positive	Positive
	(Cainelli et al., 2004; 2006;	(Cainelli et al., 2004 and 2006; Tacsir
	Evangelista and Savona, 2003;	and Vargas, 2014)
	Mansury and Love, 2008; Love et al.,	
	2011)	
Product innovation	Positive	None
	(Campagnolo and Cabigiosu, 2015)	(Campagnolo and Cabigiosu, 2015)
Process innovation	Positive	Positive
	(Campagnolo and Cabigiosu, 2015)	(Campagnolo and Cabigiosu, 2015)
Innovation new to the firm	Positive	None
	(Therrien et al., 2011; Mansury and	(Mansury and Love, 2008)
	Love, 2008)	
Innovation new to the industry	Positive	None
	(Therrien et al., 2011; Mansury and	(Mansury and Love, 2008)
	Love, 2008)	

	Variables	Obs.	Min	Max	Mean	S.D.
1	Sales growth	99	-0.98	2.44	0.04	0.75
2	Sales per employee growth	85	-2.44	2.03	0.04	0.83
3	Product innovations new to the firm	99	0	10	0.84	1.81
4	Product innovations new to the industry	98	0	10	0.5	1.63
5	Process innovation new to the firm	99	0	30	1.32	3.48
6	Process innovation new to the industry	98	0	15	0.79	2.23
7	Firm age	99	0	27	8.48	7.88
8	Graduates	99	0	100	47.27	36.91
9	Firm size	99	40000	9000000	577178.4	1050689
10	External collaborations	99	0	1	0.39	0.49
11	ICT	40	0	1	0.40	0.49
12	Professional	49	0	1	0.49	0.50
13	Design	10	0	1	0.10	0.30

TABLE 2Descriptive statistics

	Variables	1	3	4	5	6	7	8	9	10	11	12	13	14
1	Sales growth	1.00												
2	Sales per employee growth	- 0.83*	1.00											
3	Product innovations new to the firm	-0.11	0.10	1.00										
4	Product innovations new to the industry	- 0.19*	0.17	0.29*	1.00									
5	Process innovation new to the firm	-0.13	0.19*	0.48*	0.61*	1.00								
6	Process innovation new to the industry	-0.12	0.13	0.38*	0.69*	0.86*	1.00							
7	Firm age	- 0.22*	0.24*	-0.03	0.12	0.02	-0.13	1.00						
8	Graduates	0.13	-0.20*	-0.11	0.20*	0.06	0.12	-0.10	1.00					
9	Firm size	-0.15	0.26*	0.06	0.07	0.02	-0.06	0.35*	0.00	1.00				
10	External collaborations	-0.06	0.13	-0.09	0.06	-0.03	0.01	0.12	-0.07	0.04	1.00			
11	ICT	-0.09	0.07	0.23*	-0.01	0.03	-0.00	0.05	-0.30*	0.21*	0.01	1.00		
12	Professional	0.11	-0.12	-0.16	0.07	0.02	0.04	-0.08	0.36*	0.15	-0.10	0.82*	1.00	
13	Design	-0.04	0.08	-0.10	-0.09	-0.08	-0.06	0.06	-0.11	-0.09	0.14	-0.28*	-0.33*	1.00

TABLE 3Correlations

\**p*≤0.1

## TABLE 4

## OLS models results for all the hypotheses formulated (Robust standard errors in parentheses)

1	2	3	4	
Variables	Sales growth	Sales per	Sales per	
r un nubles	Sules growin	employee growth	employee growth	
Constant	0.13	0.10	0.12	
Constant	(0.27)	(0.24)	(0.25)	
Product innovations new	-0.01	0.06	-0.04	
to the firm	(0.01)	(0.11)	(0.04)	
Product innovations new	0.01***	0.01	0.17	
to the industry	(0.00)	(0.14)	(0.10)	
Process innovation new to	0.04	-0.00	0.22**	
the firm	(0.07)	(0.01)	(0.12)	
Process innovation new to	-0.12	0.03	0.17	
the industry	(0.07)	(0.10)	(0.10)	
<i>P</i> .	-0.02**	0.01	0.01	
Firm age	(0.01)	(0.01)	(0.01)	
Curduates	0.00	-0.00	-0.04	
Graduales	(0.00)	(0.00)	(0.03)	
Eine size	-6.25e-08	1.68e-07**	1.59e-07	
F IFM SIZE	(5.88e-08)	(6.85e-08)	(2.05e-07)	
External collaborations	-0.04	0.13	0.09	
External collaborations	(0.15)	(0.17)	(0.17)	
ICT	0.06	-0.25	-0.20	
	(0.27)	(0.26)	(0.26)	
Ductorsional	0.11	-0.19	-0.19	
Frojessional	(0.26)	(0.23)	(0.25)	
Process innovation new to	_	_	-0.62**	
the firm x firm size	_		(0.25)	
Process innovation new to	_	_	0.23	
the industry x firm size			(0.57)	
Product innovation new			-0.39	
to the firm x firm size			(0.47)	
Product innovation new			1.27	
to the industry x firm size			(2.06)	
R <sup>2</sup>	0.12	0.19	0.26	
Ν	99	85	85	

\*p≤0.1; \* p≤0.05; \*\* p≤0.01\*\*\*

Figure 1 Plot of the interaction effect of *firm size* over the relationship between *Process innovation new to the firm* and *Sales per employee growth* 



# TABLE 5OLS models results to test H2 for firms smaller and bigger than the median (Robust standard errors in parentheses)

1	2	3
	Firm size lower	Firm size higher
	than the median	than the median
Variables	Sales per	Sales per
, ai tao tes	employee growth	employee growth
Constant	-1.16***	0.49
Constant	(0.40)	(0.54)
Product innovations new	-0.07	-0.00
to the firm	(0.07)	(0.00)
Product innovations new	0.20	0.23
to the industry	(0.17)	(0.17)
Process innovation new to	0.33***	-0.15*
the firm	(0.11)	(0.08)
Process innovation new to	-0.20	-0.06
the industry	(0.21)	(0.14)
Finm ago	0.04**	-0.01
r irm uge	(0.02)	(0.02)
Cuaduatas	-0.00	-0.01
Graduales	(0.00)	(0.04)
Einne eine	4.48e-06***	1.74e-07**
Firm size	(1.40e-06)	(7.57e-08)
Futan al a llabourtions	0.31	-0.10
External collaborations	(0.23)	(0.27)
ICT	-0.10	-0.11
	(0.21)	(0.51)
Professional	-0.22	0.30
	(0.28)	(0.41)
$R^2$	0.61	0.25
Ν	37	38

\*p≤0.1; \* p≤0.05; \*\* p≤0.01\*\*\*