

**COOPERATION AND INNOVATION IN THE INTERNATIONALISATION OF
KNOWLEDGE-INTENSIVE BUSINESS SERVICES (KIBS)**

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Abstract

The services sector is the most important sector in Spain and Europe today. Furthermore, it is the sector that has experienced the fastest growth in recent years. However, the attention it has received has not been commensurate with its size and role in international commerce. Consequently, the aim of this paper is to further the study of internationalisation among service firms, particularly knowledge-intensive ones. Specifically, in it we analyse the impact of cooperation and innovation capacity on internationalisation using the Spanish Technological Innovation Panel data for the period 2003-2005. This paper finds a positive relationship between cooperation, innovation and internationalisation of knowledge-intensive business services.

Keywords: Internationalisation, Services, Innovation, Cooperation, Knowledge-intensive business services

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INTRODUCTION

Nowadays, services firms are internationalising more—and faster—than ever before. (Miozzo and Miles, 2003; Contractor et al., 2003; Javalgi and Martin, 2007). In recent years, this phenomenon has unleashed an increase in the number of studies on internationalisation in the services sectors (Toivonen, 2004; Hitt et al., 2006; Brock et al., 2006; among others). The importance of services firms in international trade makes it necessary to take a more in-depth look into the internationalisation process they have undergone.

The literature on manufacturing firms finds evidence that technology and innovation are factors that help to ease the entry into international markets (Basile 2001; Dhanaraj and Beamish, 2003). This leads us to look at the potential of innovation as a significant factor in the internationalisation of services firms. These two phenomena -internationalisation and innovation- have rarely been analysed together within the scope of the services sector. Hence it's necessary to carry out further studies examining this relationship.

On the other hand, cooperation is also becoming an increasingly frequent occurrence in an international and technology context, so we cannot ignore it when analysing internationalisation decisions. Establishing, developing and maintaining cooperation may help firms to internationalise their operations and build their innovation capacity because it affords access to the resources, technologies, information and knowledge of their partners. Thus, in our attempt to study internationalisation in the services sector, we believe it is pertinent to analyse the implications of cooperation. Specifically, we look at the possible influence of cooperation on internationalisation in two ways: one directly, the other, indirectly, through its impact on innovation.

Within the services sector, we are especially interested in knowledge-intensive business services (hereinafter, KIBS). In European countries, it is estimated that these services account for, on average, 15 per cent of sales of business services. These are also firms that play a vital role as knowledge providers (Miles, 2005). KIBS can be defined as firms in which most of the work carried out is of an intellectual nature and whose main asset is highly qualified human capital. Examples of disciplines

considered knowledge-intensive are: software, legal services, auditing, consultancy, advertising, engineering, and computer & IT consultancy. Nowadays, KIBS are especially important as lead players in internationalisation processes, acting as facilitators, carriers and sources of innovation (Miles et al., 1995; Den Hertog and Bilderbeek, 1997; Den Hertog, 2000). They therefore play a growing role in the corporate arena, a role that is reinforced when they establish strategic relationships with other market agents. This has prompted our attention and compels us to deepen our study, as other researchers have done recently (Den Hertog, 2000; Miles, 2001; Kam and Singh, 2004; Prashantham and Berry, 2004; Toivonen, 2004; Miles, 2005; Tsai et al., 2005; Freel, 2006; Tödling et al., 2006; Ojanen et al., 2007, among others).

The main aim of this paper is to analyse the implications of innovation and, directly and indirectly, of cooperation on the internationalisation of KIBS firms. Specifically, on the one hand, we look at whether there is any relationship between innovation and internationalisation of services firms. More specifically, at whether capacity for innovation can be considered a driving force behind internationalisation through its impact on the propensity of KIBS to internationalise. We also look at whether cooperation has any influence on the international growth of these firms or on their capacity for innovation.

The structure of this paper is as follows: first, we review the existing literature on internationalisation, innovation and cooperation, and set up our hypotheses. Next, we describe our empirical analysis of the data. Lastly, we state our conclusions, limitations and future lines of research.

THEORY AND HYPOTHESES

Internationalisation strategies of services firms

In order to analyse the internationalisation of KIBS, one must first understand the idiosyncrasies of these services. Traditionally, when studying internationalisation of services, these are defined as being different from goods (Contractor et al., 2003). The services share certain characteristics—intangibility,

inseparability, heterogeneity, ownership, perishability and intensity of relationship between producer and consumer (Cowell, 1986; Clark and Rajaratnam, 1999; Haukness, 2001; Bowen and Ford, 2001, Javalgi and Martin, 2007)—that make them different from goods. This leads to a discussion of whether internationalisation theories, which for the most part had been developed with regard to manufacturing concerns, are directly applicable to services firms (Johanson and Valhne, 1990; O’Farrell et al., 1998; Knight, 1999, among others). The issue appears to have been resolved since most internationalisation theories have successfully been applied directly to services (Boddewyn et al., 1986; Katrishen and Scordis, 1998; Axinn and Mathyssens, 2001; Javalgi et al., 2003, among others). The eclectic paradigm (Dunning, 1989; Enderwick, 1989; Katrishen and Scordis, 1998; Javalgi et al., 2003), sequential models (Hellman, 1994), network theories (Coviello and Martin, 1999) and resources and capacities theory (Fahy, 1996) have all provided a useful framework for internationalisation of services. Nevertheless, some authors believe it is necessary to go beyond this, extending the current research and adapting it within the context of services firms (Javalgi and Martín, 2007; Reihlen and Apel, 2007).

Nevertheless, different types of services have been identified within the services sector (see Clark and Rajaratnam, 1999; Samiee, 1999). The typology defined by Erramilli and Rao² (1990) is the one most often used in services internationalisation studies (Ekeledo and Sivakumar, 1998; Jones and Coviello, 2005; Blomstermo et al., 2006). This typology, which is based on the separability of services, categorises services as either soft or hard. Soft services are characterised by their inseparability, i.e., by the extreme difficulty or even impossibility of separating their production from their consumption. Examples of these services include restaurants and health services. On the other hand, hard services are those characterised by their separability—the ease with which their production and their consumption is separated—, their intangibility, their ability to be inventoried or accumulated, their homogeneity, and their dependence on a physical object in order to be stored and exported.

² It is the most versatile since other services classifications offered in the literature (see Patterson and Cicic, 1995, Clark et al., 1996 or Lovelock and Yip, 1996) can eventually be categorized into one of the two types set out in the typology: hard/soft services.

This classification has significant implications for modes of entry into foreign markets. In the past, some authors (Carman and Langeard, 1980; Root, 1987) have stated that exports are not a viable option for internationalising service firms. This conclusion is valid for soft services that, true enough, cannot be exported since exporting requires there to be a separation between the producer and the consumer. In contrast, that is not the case with firms offering hard services, among which exporting is more frequent (Erramilli and Rao, 1990), contradicting the existing literature.

KIBS can be identified as hard services. Therefore, our research is based on firms selling exportable services. This increases KIBS' opportunities for internationalisation. Although it also requires them to be competitive in the destination country from the host country, which means that the firms must possess distinctive resources in order to compete on the international markets. Among the resources that might be relevant to their international expansion, we highlight, first, the development of innovation, and second, collaborative relationships between firms that provide them with resources to which they would not otherwise have access.

Innovation in services

As with internationalisation, the idiosyncrasies of the services sector has led many to question whether innovation by services firms is any different in its fundamental features and elements from innovation by manufacturing firms (Evangelista, 2000, Preissl, 2000; Drejer, 2004, among others). In this regard, as the study of innovations in services has evolved, several approaches have emerged to define and study innovation in the services sector (Coombs and Miles, 2000): assimilation, demarcation and synthesis.

The first stage was the “assimilation approach”, according to which innovation in services is similar to innovation in the manufacturing sector. Consequently, it was thought that it could be studied using the methods and concepts already set out in the traditional literature on innovation (Barras, 1986, 1990; Gallouj, 1998; Miozzo and Soete, 2001; Gallouj, 2002, among others). This was followed by the “demarcation (or differentiation) approach”, according to which innovation in services is different

from innovation in goods given that it has different functions and features, the study of which demands new theories and instruments (Gadrey et al., 1995; Sundbo, 1997; Sundbo and Gallouj, 1998; Coombs and Miles, 2000; Van der Aa and Elfring, 2002). This has given rise to the “synthesis approach” in recent years, based on the existence of elements of innovation that have been ignored and which are now considered relevant to any sector (Coombs and Miles, 2000; Miles, 2001; Sundbo, 2001; Drejer, 2004). This approach aims to produce a theory that is relevant to both services and manufacturing (De Vries, 2006) based on the general idea of convergence, the growing interdependence between manufacturing and services (Coombs and Miles, 2000; Miozzo and Soete, 2001) and the idea that many physical products that are sold contain certain services, and that services are sold in combination with physical products (Shostack, 1987; Gadrey et al., 1995; Sundbo, 2001).

While thus engaged, the literature of recent years has tended to examine possible similarities and differences between product and services innovations, attempting to discern what proportion of the knowledge developed in manufacturing innovation is applicable to services and to detect where services really differ (Gadrey et al., 1995; Johne and Storey, 1998; Tidd and Hull, 2003; Hipp and Grupp, 2005; Nijssen et al., 2006, among others). Here, it can be considered that factors needed for innovation in new products are the same as those required to develop new services, and that any difference between the two lies in the importance or the relative weighting of the factors (Nijssen et al., 2006). Nevertheless, a recurrent topic in the literature is that developing services is different from developing (tangible) products. From the point of view of both producer and buyer, there are undoubtedly differences that can be described in terms of the intangibility, heterogeneity and simultaneity of the services (Johne and Storey, 1998). Thus, for instance, the close relationship between production and consumption in the services sector makes it more difficult to distinguish between product and process innovation than in the manufacturing sector (Gallouj and Weinstein, 1997; Evangelista and Savona, 1998).

The main differences between the innovations and the innovation processes in services firms and those in manufacturing concerns lie essentially in the increased importance of the human factor, the organisation of the innovation process, the greater difficulty in protecting innovations, the types of

innovation, the speed of innovation and its integration with customers (Coombs and Miles, 2000; Hipp and Grupp, 2005).

The human factor. Knowledge and human capital are fundamental resources in services firms. Consequently, investment in human resources plays an especially important role in innovation by those firms (Miles, 2001) and it is believed that a lack of qualified personnel may constitute a barrier to innovation (Sirilli and Evangelista, 1998).

Organisation of the innovation process. Many innovations in services sectors use technological developments—e.g., ICT—as a medium through which to create new services and processes or improve existing ones rather than to offer pure technological progress (Hipp and Grupp, 2005). The innovation process in services firms is one of “search and learn”. Innovation occurs on the basis of new ideas and combinations of existing services that provide *ad hoc* solutions to problems rather than on the basis of scientific results (Sundbo, 1997). Organisation of the innovation process encompasses not only the customary R&D departments of manufacturing concerns—which services firms rarely have (Sundbo, 1997; Toivonen, 2004)—but also a number of functional units that are of equal importance within the firms, e.g. sales or marketing. This is reflected in the lesser R&D effort that services firms claim to engage in compared to manufacturing firms (Hipp and Grupp, 2005).

Difficulty in protecting innovations. From the moment that services are defined as processes that do not possess physical aspects, they are liable to be modified more easily than are physical products or processes (Johne and Storey, 1998) and, similarly, they can be copied more easily by their competitors (Atuahene-Gima, 1996; Johne and Storey, 1998; Storey and Easingwood, 1998). Thus, the intangibility of services makes it more difficult to protect the innovations, which could reduce the incentive to carry out innovation activities in the services sectors (Hipp and Grupp, 2005).

The types and speed of innovation. Incremental innovations (those that are new to the firm but not to the market) are predominant among services firms (Hipp and Grupp, 2005). The innovation process is very rapid due mainly to its incremental nature and to the fact that it is often the result of imitation within or between sectors (Djellal and Gallouj, 2001). The ease with which innovations in services can

be copied leads to the conclusion that it is necessary to develop innovation processes continuously (Sundbo, 1997).

Customer integration. Interaction with customers is a distinctive element of services and, in some services, a fundamental aspect. Hence, service providers must develop not only the service itself, but also the precise manner in which it is delivered to customers (John and Storey, 1998). As a result of the interaction between service providers and their customers, some innovation activities are aimed at adapting the services to the users' needs, which might in itself be considered a form of innovation.

In summary, we can conclude that innovation and innovative processes by services firms show certain idiosyncrasies vis-à-vis those of manufacturing firms. Factors such as human capital or customer interaction acquire greater prominence while traditional investment in R&D has a diminished role. Overall, innovations tend to be incremental and to focus on client needs, and it is more difficult to protect them.

The impact of innovation on internationalisation

The relationship between innovation and internationalisation has been studied mainly in manufacturing concerns (Basile, 2001; Fors and Svensson, 2002; Jeong, 2003; Dhanaraj and Beamish, 2003; Castellani and Zanfei, 2007; Tomiura, 2007; Vila and Kuster, 2007; Wang et al., 2008). In this context, the possible influence of innovation on internationalisation has been analysed. The departure point is the capacity for innovation conceived as a relevant competitive dimension to explain and understand the internationalisation decision. Results of previous studies show that innovation is an important factor that helps to explain the heterogeneity of company exports (Boter and Holmquist, 1996; Wakelin, 1998; Basile, 2001; Basile et al., 2003; Dhanaraj and Beamish, 2003; Knight and Cavusgil, 2004; Hollestein, 2005; Tomiura, 2007, among others).

However, this prolific analysis of the impact of innovation on internationalisation has not been carried out for services firms (Miozzo and Miles, 2003), and certainly not for KIBS. Among the few studies that deal jointly with innovation in and internationalisation of services (Blind and Jungmittag, 2004;

Frenz et al., 2005; Luo et al., 2005), we would highlight the findings of Luo et al. (2005), which reveal the existence of a positive relationship between speed of entry into foreign markets and innovative capacity among electronic commerce firms.

Specifically, in order to be successful in their attempts to enter international markets, KIBS must be able to develop their services and interact with customers abroad. To do so, they must be able to adapt their services and the manner in which they deliver them to the new contingencies, something that will depend, to a large extent, on their capacity for innovation. Consequently, we consider the development of innovative capacity an important competitive factor in the internationalisation strategy of KIBS. This relationship is expressed in the following hypothesis:

Hypothesis 1: The development of innovation services has a positive impact on the internationalisation of knowledge-intensive business services.

Cooperation

In recent years, collaboration between the distinct agents involved in commercial transactions (clients, suppliers, competitors, etc.) has played a prominent role in corporate development (Gulati, 1998; Gulati et al, 2000; Oviatt and McDougall, 2005, among others).

Cooperation and internationalisation

Cooperation affords firms access to resources and markets. Collaboration between firms allows them to reach their strategic objectives, sharing risk and externalising activities in their value chain (Gulati et al., 2000). In an international context, it allows them to develop capabilities that are relevant to their operations in foreign markets (Mort and Weerawardena, 2006; Elango and Pattnaik, 2007). Hence, collaboration offers partners a better knowledge of the international markets, reducing some of the risk inherent in internationalisation processes (Chetty, 2003; Elango and Pattnaik, 2007). This capacity to become acquainted with the characteristics of other countries and the business opportunities they offer affects the propensity and speed of internationalisation, thus making it easier for new ventures to

internationalise (Coviello and Munro, 1995; Madsen and Servais, 1997; Chetty and Holm, 2000; Chetty, 2003; Oviatt and McDougall, 2005). The impact of cooperation on international sales growth has been documented for manufacturing firms both in developed countries (see Welch et al., 1998) and in emerging markets (Elango and Patnaik, 2007).

In the context of services, collaborative relationships are considered bridges to foreign markets, and they offer service firms the opportunity and motivation to internationalise (Korhonen et al., 1996; O'Farrell and Wood, 1998; Boojihawon, 2007). In the case of KIBS, one should also take into account that the environments in which they operate are characterised by rapid technological change, growing research costs and increasingly short product life cycles (Prashantham and Berry, 2004). Consequently, we assume that they carry out their activity in a context of greater competitive intensity and uncertainty than do manufacturing concerns (McNaughton, 2001). This accentuates the need for and the impact of cooperation (Coviello and Munro, 1997).

In conclusion, collaboration can become a powerful competitive tool for KIBS by allowing them to share resources and experiences that ease their entry into foreign markets. This leads us to posit the following hypothesis:

Hypothesis 2: Cooperation has a positive impact on the international presence of knowledge-intensive business services.

Cooperation and innovation

Cooperation can be seen as an important tool to gain access to knowledge, distribution channels or resources for innovation (Tödling et al., 2006). The literature shows that collaboration between firms has the potential to facilitate knowledge exchange and acquisition among them (Powell et al., 1996; Inkpen and Tsang, 2005).

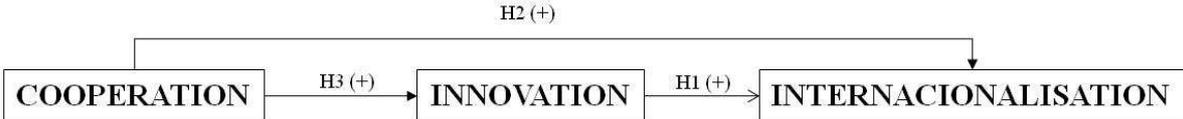
Specifically, technological collaboration with suppliers and clients is considered a positive factor in achieving innovation (Whitley, 2002; Nieto and Santamaría, 2007). Here, the literature indicates that a

close relationship with suppliers and customers constitutes a significant source of innovation for firms (Von Hippel, 1985, 1988). Thus, for instance, in the manufacturing sector, firms maintain external networks and customer relationships that are of enormous importance to their innovation activities (see, for example, Von Hippel, 1988). In the services sector, these will tend to be even more important, given that customer participation and relations are even closer and more significant (de Brentani, 1989).

Several studies show that certain types of cooperation have a positive effect on the probability of innovation and on the novelty of the innovations obtained (Miotti and Sachwald, 2003; Belderbos et al., 2004; Nieto and Santamaría, 2007). We can therefore state that business collaboration is important in the achievement of innovation and in its success (Ritter and Gemünden, 2003). In particular, cooperation can be considered especially necessary in technology- or knowledge-intensive sectors because collaboration reduces uncertainty, affords access to resources and complementary technologies, and with it, accelerates the innovation process (De Bresson and Amesse, 1991; Fritsch, 2003; Fritsch and Franke, 2004). Based on the above considerations, we can derive a possible positive relationship between cooperation of KIBS and their innovative capacity, as stated in hypothesis 3:

Hypothesis 3: Cooperation has a positive impact on the capacity for innovation of knowledge-intensive business services.

The following illustration summarises the relationships that are represented by the working hypotheses.



EMPIRICAL ANALYSIS

Sample

For the empirical analysis, we used the Spanish National Statistics Institute (INE)'s "Technological Innovation in Companies Survey", known as the Technological Innovation Panel (henceforth, PITEC). This survey is a study belonging to the EU's statistical programme; its aim is to provide information on firm's technological innovation process. It provides company data over several years, allowing us to use methodologies based on the panel data.

The PITEC records data for firms in the industrial and services sectors. In our analysis, we have used only firms that were considered knowledge-intensive business services. The literature shows several classification systems for KIBS. Nevertheless, in this paper, we have followed the same sample of knowledge-intensive services used by Miles (2005) and set out in Table 1. We used the results of the PITEC surveys for the years 2003 to 2005, creating an incomplete panel. Our final sample contained 5,517 observations, although the number of observations in the models was smaller because missing values exists for one or more variables, and for the lagged variables introduced in the models.

Table 1.- Knowledge-intensive business services

NACE Classification	
72: Computer and related activities	72.1: Hardware consultancy 72.2: Software consultancy and supply 72.3: Data processing 72.4: Database activities 72.5: Maintenance and repair of office, accounting and computing machinery 72.6: Other computer-related activities
73: Research and development	73.1: Research and experimental development on natural sciences and engineering 73.2: Research and experimental development on social sciences and humanities
74: Other business activities	74.11: Legal activities 74.12: Accounting, book-keeping and auditing activities; tax consultancy 74.13: Market research and public opinion polling 74.14: Business and management consultancy activities 74.15: Management activities of holding firms 74.20: Architectural and engineering activities and related technical consultancy 74.3: Technical testing and analysis 74.4: Advertising 74.5: Labour recruitment and provision of personnel 74.8: Miscellaneous business activities n.e.c. (74.84: Other business activities n.e.c.)

Source: Adapted from Miles (2005)

Methodology and variables

In order to test the hypotheses posited, we used two econometric models: a *tobit* model to test the hypotheses on KIBS internationalisation (hypotheses 1 and 2) and a *probit* model to test the hypothesis on innovation (hypothesis 3).

The *tobit* model, in which the dependent variable is internationalisation, is a hybrid between the probit and multiple regression models. It is of use when the dependent variable is censored or shows an accumulation point at any value. It is used when the response variable can be observed only when one or more conditions are met. In our case, when looking at export intensity, we found one accumulation point at value 0, indicating that a company does not export. For this reason, the use of the tobit model is appropriate in our analysis. In statistical terms, it can be expressed as follows:

$$Y_i = \beta_1 + \beta_2 X_i + u_i \quad \text{if RHS} > 0$$
$$= 0 \quad \text{for other instances, where RHS = right-hand side.}$$

The *probit* model is used to explain dichotomous dependent variables. We therefore consider it appropriate to use this model in our analysis to determine the possible impact of cooperation on innovation.

In both cases, the methodology was adjusted to the panel data processes. The use of random panel data models allowed us to control for unobservable heterogeneity (Arellano and Bover, 1990). In order to test for the possible existence of multicollinearity between the variables, we carried out the variance inflation factor (VIF) test. Individual values greater than 10 indicate problems with multicollinearity, as does a mean VIF value greater than six. The values set out in Table 3 show that there is no problem with multicollinearity in the models used.

The following section describes the variables used in our econometric analysis in the two specified models.

Dependent Variables: *Export Intensity* (INTEXP), to analyse KIBS internationalisation we used export intensity. This variable is the result of dividing a firm's exports by its total sales. This is a continuous variable with values lying between 0 and 1; *Innovation* (INNOVA), this variable is used as an indicator of a firm's innovation results. This dichotomous variable takes a value of 1 if the firm has engaged in any service or process innovation, or filed a patent during the period $t-2$ to t , and a value of 0 if it has not.

Independent Variables: *Cooperation* (COOPERA), this dichotomous variable takes a value of 1 if the firm has cooperated with other non-commercial firms or organisations on innovation activities during the period between $t-2$ and t , and a value 0 otherwise; *Innovation* (INNOVA), this variable is used as an indicator of a firm's innovation results. In model 1 it is included as an independent variable.

Control Variables: *R&D Intensity* (INTRD_1) is used as an indicator of company investment on research and development. It is the ratio of R&D Expenditure/Total Sales. The variable is included with a delay of one period; *Formation* (FORM). A dichotomous variable that takes a value of 1 if the firm incurs training expenses, and 0 if it does not; *R&D Personnel* (RDP), refers to employees engaged in R&D activities within the firm. The variable used is the result of dividing the number of employees engaged in R&D by the total number of employees; *Size* (TAMANO): A quantitative variable indicating the number of employees belonging to a firm in t ; *New venture* (NEWFIRM): A dichotomous variable that takes a value of 1 if the firm was created in the previous two years; *Group* (GRUPO): A dichotomous variable that indicates whether the firm belongs to a group of companies. *Type of firm*: four types were identified, public (PUBLIC), private domestic (PRIVDOM), private multinational (PRIVMUL) and research organisation (RESASOC). These are dummy variables that allow us to control for the various types of firms. *Sectors*, we introduced four dummy variables to control for sector affiliation by firms. Services considered knowledge-intensive—described in table 1—are grouped into four categories: computer and related activities (S-INFORM), research and development (S-R&D), technical services (S-TECNIC), legal, business consultancy, advertising, etc. to other firms (S-OTHERACTI). Table 2 sets out the descriptors of the variables used and their correlations.

Table 2.- Correlation Matrix and Descriptors

	Mean	Standard deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	VIF ¹	VIF ²		
1.Innova	0.595	0.490	1.000														1.50			
2.Coopera	0.305	0.460	0.4336	1.000													1.30	1.29		
3.IntRD_1	0.125	0.210	0.3315	0.3078	1.000													1.93		
4.Newfirm	0.050	0.219	0.1118	0.0392	0.1547	1.000												1.06		
5.Form	0.241	0.427	0.3713	0.2820	0.2028	0.0486	1.000											1.18	1.14	
6.RDP	0.234	0.316	0.4122	0.3749	0.6295	0.1419	0.2306	1.000										1.48	1.87	
7.Tamano	375.8	1418.5	-0.1322	-0.0793	-0.1528	-0.0330	-0.0613	-0.1628	1.000									1.11	1.14	
8.Grupo	0.311	0.463	-0.0478	0.0129	-0.1519	-0.0404	-0.0209	-0.1353	0.2210	1.000								1.08	1.23	
9.Public	0.022	0.148	0.0252	0.0371	-0.0160	-0.0222	0.0098	-0.0314	-0.0014	0.0437	1.000								1.02	
10.Privmul	0.656	0.247	-0.0293	-0.0211	-0.0970	-0.0412	-0.0115	-0.0943	0.1855	0.3725	-0.0436	1.000							1.19	
11.Resasoc	0.329	0.178	0.1198	0.1911	0.2786	-0.0093	0.0970	0.2344	-0.0405	-0.1193	-0.0258	-0.0478	1.000						1.30	
12.S-Inform	0.334	0.471	0.2681	0.0582	0.0984	-0.0075	0.1423	0.1109	-0.1306	-0.0177	-0.0383	0.0370	-0.0997	1.000					1.62	1.51
13.S-R&D	0.071	0.256	0.1538	0.2074	0.4638	0.0539	0.1267	0.3852	-0.0563	-0.0813	-0.0049	-0.0255	0.4564	-0.1651	1.000				1.45	1.80
14.S-Tecnic	0.239	0.426	0.1528	0.1671	0.0663	0.0587	0.0542	0.1158	-0.1077	0.0153	0.0959	-0.0452	-0.0178	-0.3884	-0.1305	1.000			1.52	1.48

¹Model 1; ²Model 2

Results

The results obtained offer empirical support for all of the hypotheses posited. The estimated coefficients for the two models are shown in Table 3. Results shown in the first column are for the *tobit* model used to test hypotheses 1 and 2 empirically. The estimated coefficients shown in the second column are for the *probit* model used to compare hypothesis 3 empirically. Both models are statistically significant at the one per cent level.

Table 3.- Results of internationalisation and innovation in KIBS

	Intexp (1)	Innova (2)
Innova	0.1017*** (6.68)	-
Coopera	0.0318** (2.35)	1.7761*** (9.74)
IntRD_1	-	0.2480 (0.66)
Newfirm	-0.1173***(-3.89)	2.2972*** (3.36)
Form	0.0215* (1.78)	1.3223*** (8.90)
RDP	0.0078 (0.33)	2.7236*** (7.31)
Tamano	-0.00002** (-2.48)	0.00002 (0.52)
Grupo	0.1475*** (8.09)	-0.0642 (-0.46)
Public	-	0.3345 (0.87)
Privmul	-	0.0845 (0.36)
Resasoc	-	1.4111** (2.35)
S-Inform	0.1756*** (6.93)	1.7989*** (9.07)
S-R&D	0.2109*** (5.10)	0.6833* (1.61)
S-Tecnic	0.2108*** (8.51)	1.2571*** (6.59)
Constant	-0.5256*** (-20.62)	-1.5617*** (-10.50)
<i>Wald test of full model (x²)</i>	249.54***	217.87***
<i>Log. Likelihood</i>	-1465.182	-1178.884

Model 1: Tobit (independent variable: export intensity). Total observations: 5.464; Model 2: Probit (independent variable: results of innovation). Total observations: 2.874; ***p<0.01, **p<0.05, *p<0.10.

In model 1, the coefficient of the innovation variable (INNOVA) is positive and significant, in accordance with the positive relationship between innovation and internationalisation postulated in hypothesis 1. Similarly, the coefficient of the cooperation variable (COOPERA), is also positive and significant, suggesting that cooperation between KIBS and other firms or institutions is positively linked with their international growth. This therefore provides empirical evidence for hypothesis 2.

In model 2, the coefficient of the cooperation variable (COOPERA) is positive and very significant, which suggests, as was posited in hypothesis 3, that cooperation has a positive impact on the innovation results of KIBS.

One of the control variables that stands out, in line with existing literature on services innovation, is INTRD_1 due to the non-significance of the coefficient. This fits in with the idea that services firms invest less in formal R&D. The FORM and RDP coefficients are positive and very significant with regard to innovation, which bears out the importance of human resources on the probability of innovation among KIBS. The significance of these variables vis-à-vis internationalisation is limited to the formation variable, for which the coefficient is positive. This suggests that expenditure on personnel training among KIBS increases their chances of internationalisation.

The coefficients of the NEWFIRM variable are significant in both cases. However, they are of opposite signs. In the case of internationalisation, the coefficient is negative, which indicates that newly created KIBS have a lower probability of exporting their services. This may be because new venture have more limited resources with which to approach the international markets. In contrast, regarding innovative results, the NEWFIRM coefficient is positive, which suggests that newly created KIBS stand a greater chance of generating innovations. This may be because they may be firms set up specifically to exploit an innovation.

The coefficients of the GRUPO and TAMANO variables turn out to be significant only with regard to the internationalisation of KIBS. The positive coefficient for GRUPO tells us that if KIBS are part of a corporate group, they have a greater chance of becoming international in scope. The estimated coefficient for TAMANO is negative, which points to an inverse relation between KIBS size and the likelihood of expanding internationally. However, it should be noted that the value is very close to 0.

Of the three variables that specify the type of company, PUBLIC, PRIVMUL and RESASOC, only the latter shows a coefficient that is both positive and significant. This result indicates that when firms are defined as research organisations, this has a positive impact on the probability of generating innovations. Lastly, the coefficients relating to the sector categories—S-INFORM, S-R&D and S-TECNIC—are positive and significant, which suggests that KIBS membership of these sectors is linked to a higher probability of achieving innovation and internationalisation compared to the excluded category (S-OTHERACTI).

DISCUSSION AND CONCLUSIONS

This paper studies the internationalisation of KIBS, a sector that is unquestionably acquiring a prominent role in today's economies. Specifically, our aim is to analyse the degree to which capacity for innovation and collaboration have an impact on the international expansion of these firms. In general, the literature has paid scant attention to these relationships in the services sector, and, more specifically, among KIBS.

The activities carried out by KIBS makes it possible for them to offer exportable services. This feature expands their chances of internationalisation and makes the traditional theories regarding internationalisation of manufactured products more applicable to them. Thus, KIBS have the option of exporting their services, unlike other services firms in which the production and consumption of the services is simultaneous. However, much as any other company seeking to expand abroad, they must be competitive in the destination market. In order to be able to compete on the international markets, firms need to possess distinctive resources. Among the resources that could prove relevant to the internationalisation process, we would highlight the capacity for innovation, which may bring competitive advantages, allowing them to attract new clients in other markets outside their domestic borders. For this reason, our first hypothesis posits a positive relationship between innovation and internationalisation among KIBS.

On the other hand, it should be remembered that the innovations developed by KIBS differ from those traditionally sought in the industrial sector, which among other aspects, depend to a greater extent on investment in highly qualified labour and to a lesser degree on R&D expenditure. These are also innovations that are difficult to protect (Johnes and Storey, 1998) and, consequently, easier to copy (Storey and Easingwood, 1998), which implies a need for development of innovation capacities that will allow firms to continuously adapt their services. It is thus important for these firms to acquire a distinctive capacity that will bring advantages with a view to internationalisation. Similarly, collaboration is seen as a way of obtaining access to resources not available to the company both to develop innovations and to expand internationally. Our postulates presuppose a positive relationship,

direct and indirect, between cooperation and internationalisation. The direct relationship is suggested because collaboration allows KIBS to share their knowledge of markets, customers, technological changes, etc., which is especially important for firms that operate in very dynamic environments. The indirect relationship is propounded because we also expect cooperation to have a positive impact on capacity for innovation among KIBS, which in turn will make it easier for them to expand into other markets.

Our empirical analysis, which is based on the PITEC database for the period 2003-2005, supports all of the hypotheses presented in this study. In fact, the results obtained ratify the importance of innovation as a source of competitive advantage with which to undertake internationalisation processes. KIBS that claim product or process innovations are shown to have a greater capacity for facing entry into foreign markets. The importance of innovation as a factor that is relevant to international activity is thus borne out, in line with previous studies carried out on manufacturing concerns (Basile, 2001; Hollestein, 2005; Tomiura, 2007, among others). This paper also draws interesting conclusions on the innovation process in these firms. Specifically, it notes the importance of human capital on innovation results and confirms empirically that traditional activities such as R&D play a lesser role and have a smaller impact.

KIBS that establish collaborative relationships find access to international markets easier. These results are consistent with previous studies showing that inter-organizational relationships bring international advantages to firms tackle an internationalisation process (Coviello and Munro, 1995; Boojihawon, 2007, among others). These collaborations not only offer advantages for entering international markets but can also make it easier for firms to exchange resources, favouring the development of innovations. Based on this idea of mutual learning among firms by sharing knowledge and information, cooperation in KIBS may have a positive influence on their capacity for innovation. This is supported by the results of this study, which shows that there is a positive relationship between cooperation and innovation.

In summary, this paper provides an in-depth look at decisive strategies such as internationalisation, innovation and cooperation, within the scope of services firms, an area on which there are few studies. Specifically, we looked at KIBS, which operate in sectors that are of great relevance for today's economies, especially developed ones. We drew up a theoretical description of the differentiating aspects of innovation in services, e.g., less formal R&D and less R&D spending, and the relevance of a good human resources strategy, with supporting empirical evidence throughout. Likewise, the study allows us to confirm that developing their innovation capacities and their collaborative relationships may allow KIBS to move into foreign markets by serving as a bridge.

This work is not free from limitations. These, in turn, suggest future lines of research. In future studies, it would be useful to be able to expand the scope of the sample; in the present analysis we used data only for the period 2003-2005. On the other hand, with regard to the focus of the study, it would be interesting to develop an analysis comparing service firms with manufacturing concerns. Furthermore, it would be convenient to include variables measuring the use of information and communications technologies, which influence transportability and, consequently, marketability of services. Similarly, another interesting extension would be for the analysis to include other types of variables such as ownership type or company size (by carrying out a study for SMEs, for instance).

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