

**Forms and barriers in inter-firm international cooperation on innovation and R&D**

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**Abstract**

*This paper examines the co-operative cross border innovation and R&D behaviour between Argentine and Spanish firms. Using theoretical perspectives provided by the literature, we apply a survey to a sample of 540 Argentine and Spanish firms which we suspected have carried out cooperation activities with particular focus on technological innovation. Empirical evidence obtained of 104 firms on several process and out-put patterns of the cooperation relationship is presented, including firm characteristics, motives of the collaborating parties, partners, types of activities in R&D and innovation carried out, leadership, and obstacles to cooperation. Results reveal that the determinants of success differ considerably in each country, according the sector, the firm specific characteristics and funding. These differences have important implications for public policies and instruments for supporting R&D and innovation activities.*

## 1. Introduction

Knowledge creation and networking are increasingly taking place at the international level together with the emergence of the global patterns of R&D and innovation (Archibugi & Ianmarino, 2002; Criscuolo, 2004; Narula & Duysters, 2004; Edler, 2007). Current evidence on flows of R&D suggests that the global innovation environment has changed due to intensified global competition and the need to innovate more quickly at different scale. The internationalization of R&D and innovation is attributed to several causes: the major complexity of global competition with the advent of new, more differentiated products and producers; institutional change through liberalization; the impact of information and computing technologies (ICT); transformations in markets, competition and industrial organization, and adjustments in corporate strategy and business models (Ernst, 2005; OCDE, 2008).

According Pérez (2008) the process of globalization has caused the hyper-segmentation of three key areas: the value chains, the global markets and the technological capabilities. Each of these areas becomes a complex network with differentiated components. The result could be termed *integrated decentralization or systemic componentization*, where each component has a very high degree of autonomy within an inter-functional and interactive structure. These new scenarios have affected the need of firms to collaborate with other agents of the innovation systems, particularly in capital- and knowledge-intensive sectors. The increasing costs and risks associated with innovation have led firms to consider cooperation as a best option in many instances (Narula & Duysters, 2004). In addition, cooperation between state, university and private sectors and particularly inter-firm collaboration have become one of the key strategies in the analysis of the innovation processes. Several contributions of the literature on innovation systems (among others Lundvall, 1992 and Nelson, 1993) stress the fact that national specificities of patterns of interaction are at the very core of what defines a national innovation system.

Our work is closely related to these issues, exploring the extent to which Spanish and Argentine firms engage in co-operative cross border R&D behaviour and attempts to identify barriers hampering the cooperation inter-firms on R&D and innovation in both countries. The paper is structured as follows: Section 2 provides a literature review and sets out the main aspects considered on R&D and innovation inter-firm cooperation, followed by the questions research (Section 3). Section 4 explains the sample and methodology used; Section 5 presents the results and, finally, Section 6 exposes the principal conclusions and Section 7 the principal contributions and implications of this study.

## 2. Theoretical background and literature review

Several authors have realized extensive revisions on the phenomenon of cooperation and establishment of international alliances, analyzing its evolution from 1960 to the present time (Hagedoorn, 2002; Hagedoorn & Osborn, 2002; Narula & Duysters, 2004). Four subjects are the principal focus in the literature in both local and international scopes: the reasons for cooperation, the selection of the partners, the alliance management (control, conflicts, fulfillment of the alliance objectives, leadership) and the impact of the cooperation results (Parkhe, 1996; García Bayona, García-Marco & Huerta, 2001; Vonortas et al., 2003; Lundin, Frinking & Wagner, 2004).

There are multiple definitions of international cooperation on R&D and innovation, considering it as the *"the relation between different organizations based on innovation with a certain content of R&D"* (Hagedoorn, Link & Vonortas, 2000). In general, the international cooperation on R&D and innovation is seen like a strategic decision that implies a transference of knowledge (*know how*) between partners located in different countries (Barajas & Huergo, 2006). The decision to cooperate goes beyond the election of a foreign partner; introduces the company in different surroundings from its habitual environment and, like so, can have relevant implications for the management of innovation resources and activities.

The research efforts to understand the inter-firm international cooperation on R&D and innovation can be grouped in three representative currents of study (Barajas & Huergo, 2006):

- **Transaction Cost Theory**, related to the cost of participating in a market and making an economic exchange (Teece, 1987; Brockhoff, 1992)

- **Strategic Management Theory**, analyzing the interrelationship between technological cooperation and corporate strategy (Dodgson, 1992)
- **Industrial Organization Theory**, focusing in the study of the strategic behavior of firms, the structure of markets and their interactions, with special attention to the spillovers generation (Gassmann y von Zedtwitz, 1999; Hagedoorn, Link y Vonortas, 2000).

Other theoretical perspectives have been added knowledge about this thematic, as the Social Exchange Theory (Das & Teng, 2002), the Resource-Based Theory (Conner & Prahalad, 1996; Combs & Ketchen, 1999) and, more recently, the game theory (Sanna-Randaccio y Veugelers, 2001; Binenbaum, 2008). In the following we will present a brief explanation of the aspects found in the literature (**Table 1**).

Topics	Researchers
<p><i>Firm size.</i></p> <p>Although there is no consensus in the literature, the majority of authors appoint the existence of a positive correlation between the firm size and the cooperation on R&amp;D and innovation intensity.</p>	Molero (1998); Bayona, García-Marco & Huerta (2001); Hidalgo Nuchera & Albors Garrigós (2004); Narula (2004).
<p><i>Age &amp; experience firm</i></p> <p>Previous experience and age are positively correlated with the firm participation in cooperation on R&amp;D and innovation.</p>	Molero (1998); Fritsch & Lukas (2001).
<p><i>Motives for cooperation.</i></p> <p>Hagedoorn (1993) classifies motives to cooperate in:</p> <ol style="list-style-type: none"> <li>1. Motives related to basic and applied research and some general characteristics of technological development (minimizing and sharing of uncertainty in R&amp;D, reduction and sharing of costs of R&amp;D).</li> <li>2. Motives related to concrete innovation processes (capturing of partner's tacit knowledge of technology, technology transfer, technological leapfrogging, shortening of product life cycle, reducing the period between invention and market introduction).</li> <li>3. Motives related to market access and search of opportunities (internationalization and entry to foreign markets, new products and markets, expansion of product range)..</li> </ol>	Hagedoorn (1993), Bayona, García-Marco & Huerta (2001), Narula (2002), (2004); Tether (2002); Vonortas et al (2003); Kauser & Shaw (2004); Montoro, Mora & Guerras (2006)
<p><i>Activity sector &amp; technological intensity.</i></p> <p>In the case of SMEs, the extent and intensity to which they can use collaboration varies by the maturity of their primary technologies. Some firms may operate in sub-sectors which are increasingly paradigmatic and mature, while others are pre-paradigmatic and nascent.</p>	Molero (1998); Hagedoorn (1993); Narula (2002); Lundin, Frinking & Wagner (2004).
<p><i>Cooperation agents</i></p> <p>It includes the type of partner (other firm, university, research institute) and the reasons for the partner election. Cooperation can be horizontal (between competitors) or vertical (customer, supplier), intra or inter-sectorial.</p>	Dussauge, Garrette & Mitchell (2000); Fritsch & Lukas (2001); Lundin, Frinking & Wagner (2004); Montoro, Mora & Guerras (2006).
<p><i>Agreement types</i></p> <p>Formal, informal, joint venture, equity and non-equity agreements, etc.</p>	Narula & Hagedoorn (1999); Lundin, Frinking & Wagner (2004).
<p><i>Cooperation process</i></p> <p>It includes the agreement management, the initiation of the contacts between firms, the joint projects management, the organizational climate, leadership, among other aspects.</p>	Hagedoorn (1993); Khanna, Gulati & Nohria (1998); López (2008). (Hoffman & Schlosser, (2001); Gerwin y Meister, 2002; Kauser y Shaw, 2004).
<p><i>Regulatory conditions &amp; funding</i></p> <p>Governments could facilitate (or not) international collaboration by financial supporting and alleviating regulatory conditions that restrict the potential for and of cooperation. Most international activities take place within established international networks and programmes. In general, there are more multilateral programmes rather and international instruments are not an integrated part of national strategies</p>	Hidalgo Nuchera & Albors Garrigós (2004); Lundin, Frinking & Wagner (2004).

<p><i>Barriers and obstacles for cooperation</i></p> <p>Numerous barriers have been detected: financial restrictions, lack of suitable human resources, problems of appropriability of the results among partners, additional cost and time of the cooperation, inability to find suitable partners, coordination/communication problems, conflict of different interests among partners, etc.</p>	<p>Hladik (1988); Hagedoorn (1993); Dodgson (2002); Hidalgo Nuchera &amp; Albors Garrigós (2004); Tiwari &amp; Buse (2007); Teixeira, Santos &amp; Brochado (2008).</p>
<p><i>Results &amp; impact of cooperation</i></p> <p>Economic and technological improvements are considered by literature, including aspects as the effects of technological spillovers, the development of new products, the development/improvement of new or existing processes, the exploitation of complementary resources, the acquisition/creation of new knowledge, among other aspects.</p>	<p>Cassiman &amp; Veugelers (1999); Hagedoorn &amp; Schakenraad (1994); Criscuolo (2004); Kauser &amp; Shaw (2004).</p>

**Table 1. Principal aspects of international cooperation on R&D and innovation in the literature**

### 3. Research focus

From these theoretical perspectives, the principal objectives of our study are:

- to shed some light about the cooperation relationship between Spanish and Argentine firms, attending the factors summarized in the **Table 1** and, particularly,
- to identify barriers which could influence cooperation inter-firms on R&D and innovation between Spain and Argentine.

There are relevant constraints for this study due the general innovation landscape in both countries, that can be observed in **Table 2**.

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- Low level of innovation resources. The amount of R&D expenditures as part of GDP is 0.5% in Argentina and 1.3% in Spain
  - Low industry financed R&D: Argentina: 30% - Spain: 55%
  - Weak density relationships between the different actors of the respective National System of Innovation (NSI)
  - Majority of Small and Medium Enterprises (SME) and few high companies
  - Little development of risk capital
  - The principal innovation strategies in Argentina is the R&D acquisition (*external R&D*) and internal in Spain (*R&D in house*)
  - Innovative firms in Spain cooperate in innovation less than in other European countries
  - Cooperation is not relevant for the majority of Argentine firms
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**Table 2. Argentine and Spanish innovation landscape. Sources:** INDEC (2008), INE (2009) and EUROSTAT (2010)

Considering these limitations and the scarce existence of databases on inter-firm cooperation, we have considered the particular cases of firms which we suspected have realised cooperation activities (firms that have participated in international cooperation programmes and export firms). Although our analysis is primarily related to technology cooperation, we consider both technological and non-technological innovation activities performed by the firms.

### 4. Methodology & samples

We elaborate a database of 540 innovative firms from Spain and Argentine and apply a survey, obtaining a 20.2% response rate. A significant percentage (47%) of surveyed enterprises has participated in a special

governmental program, called IBEROEKA -a political instrument that arose in 1991 to reinforce the industrial competitiveness in 21 Iberoamerican countries throughout scientific and technological cooperation among innovative enterprises and other actors (Hidalgo & Albors, 2004; Hidalgo et al., 2006)<sup>1</sup>. Additional information of other firms was obtained from a database of the Spanish Institute for Foreign Trade (Instituto Español de Comercio Exterior, ICEX). The survey was realised by mail and online and we have obtained complementary information by telephone interviews.

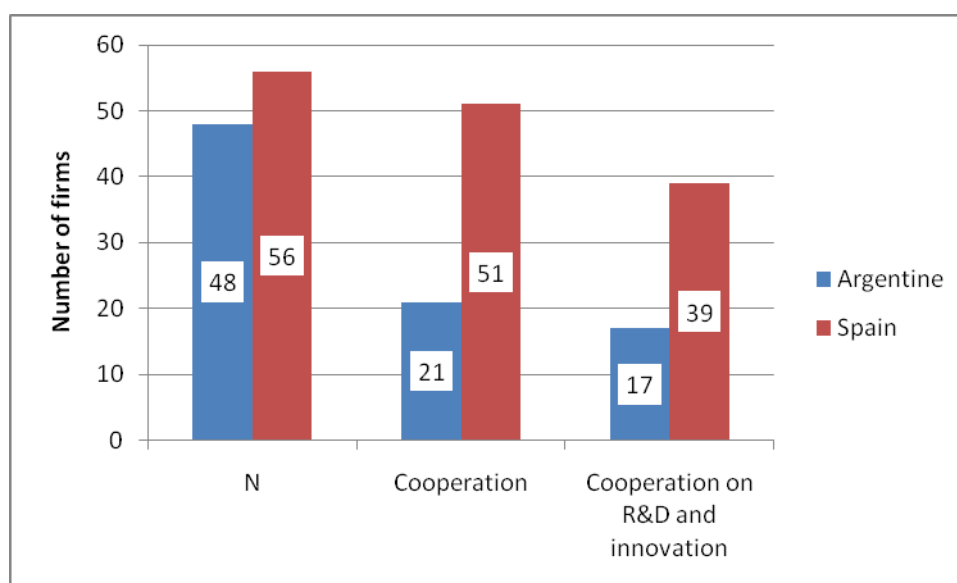
A questionnaire with both multi-item and closed-ended, as well as open-ended questions was designed. It is made up of 51 questions distributed in three parts:

- **Part 1** collects data regarding firms' background and their general characteristics (size, sector and branch of activity, human resources, etc.).
- **Part 2** solicits data pertaining to firms' general experience with cooperation relations on innovation and R&D (motives of the collaborating parties, modes of cooperation, types of partners, previous experience in cooperation with other firms, universities, technological institutes and other agents, forms of agreements and expected outcomes, investments and public support for innovation activities and results of cooperation, among other aspects).
- **Part 3** collects data concerning to cooperation relationship between Spain and Argentine, attending to the in-puts, out-puts and the cooperation process.

## 5. Results

### 5.1 Firms' characteristics

The majority of the Spanish companies affirm to be innovative (53 of 56 firms, 94.6%) and with favorable attitude to the cooperation (51, that represents the 91.1%). The 70% of the Spanish firms have cooperated in general with other firms in the last three years (39 firms). In Argentina the results are rather more unfavorable, 20 of 48 firms affirm to innovate (41.7%) and 21 to cooperate with other companies (43.8%). Finally, only 17 Argentine companies have cooperated in R&D and innovation with Spanish companies, which represent little more of the third part of the companies (35.4%) (**Figure 1**). The 80.4% (45 companies) export, being the percentage similar in both countries (12 of 17 Argentine firms and 33 of the 39 Spanish firms, 70.6% and 84.6% respectively).



**Figure 1. Cooperation between Argentine and Spanish firms**

<sup>1</sup> We have collected data with Argentine and Spanish firms participants in the IBEROEKA projects during 1991-2008.

### *Firm size*

SMEs are the cooperation protagonist, 14 of 17 Argentine companies (that constitute the 82.4%) and 26 of the 39 Spanish firms (66.7%). No of the great companies of Argentina has cooperated and they have done it 5 of Spain (8,9%). These results differ from the literature, where usually cooperation is realized by big companies, with an ample presence in the market and a high R&D intensity (Hagedoorn & Schakenraad, 1994; Vonortas, 1997; Tether, 2002). Also according to empirical studies realized in Spain (Buesa & Molero, 1998; Fonfría, 1998; Bayona, García-Marco & Huerta, 2001; López, 2008).

### *Age*

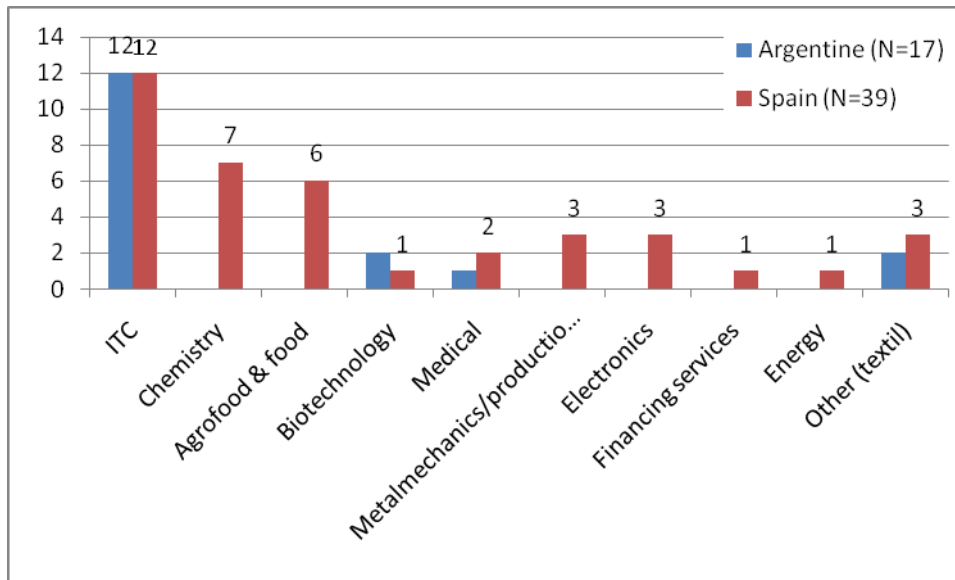
In general cooperation is performed by young companies, since more than half has 20 years of antiquity and the third part has less than one decade of existence. The maxim of frequency corresponds to companies from 20 to 50 years old and percentage that represents companies of more than 50 years ascends to the 9.1% (see **Table 3**).

Age [year]		Argentine firms N=17	Spanish firms N=39	Total N=56 Frequency	%
Valid	Minor of 5	4	4	8	14.5
	5 to 10	3	9	12	21.8
	10 to 20	5	5	10	18.2
	20 to 50	5	15	20	36.4
	50 to 100	0	4	4	7.3
	More than 100	0	1	1	1.8
	Total			55	98.2
Missing Value			1	1	1.8
Total		56			100.0

**Table 3. Age of Argentine and Spanish firms**

### *Activity sector & technological intensity*

**Figure 3** shows the firms distribution according to the activity sector. ITC is the most representative sector of the total sample with 24 companies (42.9% of the sample). Also is one of the principal sectors that usually participate in the program IBEROEKA (Alderete, 2007; CDTI, 2009). IBEROEKA is a program for the international cooperation in R&D and innovation oriented at Iberoamerican environment. It has began in 1991 within the Program CYTED (Science and Technology for the Development) assumed by the Spanish Government and the Economic Commission for Latin America (CEPAL) with the purpose of improving the technological cooperation between firms of Spain, Portugal and Latin America (see <http://www.cyted.org/>).



**Figure 2. Argentine and Spanish firms**

The 76.8% of the companies that have cooperated are of high and medium-high technological intensity and only the 23.2% of low and low-medium intensity. This tendency is still more stronger than for the Argentine firms (**Table 4**). It agrees with the literature indicating recently on the accomplishment on the part of the SMEs of innovation activities in certain sectors and technologies of end. Two valid examples in this sense constitute the innovation performance of the SMEs born *globals* and the participation of SMEs in the Seventh Framework Programme (FP7), where SMEs have obtained a volume of returns superior to the great companies (CDTI, 2007).

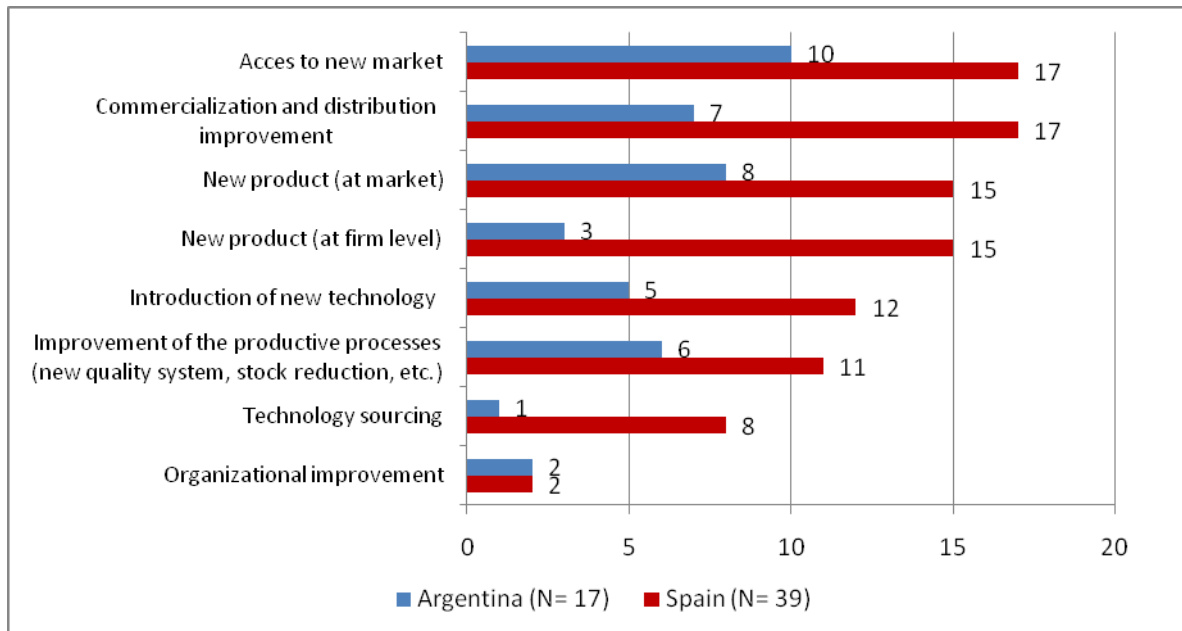
Technological intensity	Argentine firms N=17	Spanish firms N=39	Total N=56
High & medium-high	15 (88.2%)	28 (71.8%)	43 (76.8%)
Low & low-medium	2 (11.8%)	11 (28.2%)	13 (23.2%)

**Table 4. Argentine and Spanish firms according their technological intensity**

## 5.2 Motives for cooperation

### *Motives for cooperation in general*

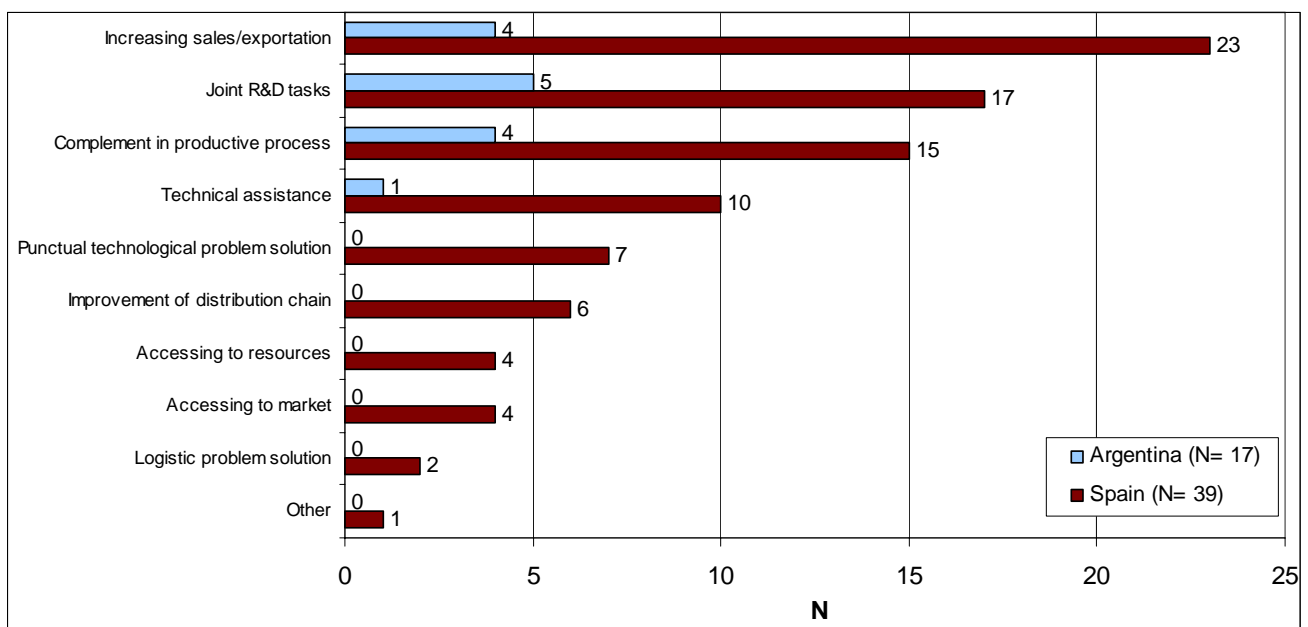
With respect the firm motives to cooperate with other firms, the first purpose is the access to new markets, followed of the commercialization and distribution improvement and the introduction of new product in the market. Also other reasons are the introduction of a new technology in the company and the improvement of the productive process (with a new quality system, stock reduction, etc.). The access to resources or the organizational improvement seems to be of less importance (**Figure 4**).



**Fig. 4. Motives for general cooperation between Argentine and Spanish firms (N= 56)**

*Motives for specific cooperation on R&D and innovation*

The first argument is the firm strategy from enter to new markets (27 companies show that the main reason is the interest in increasing to the sales/exports). Joint R&D tasks, technology complementarity, technical assistance and the punctual technical problem solution are the following cooperation motives, as a logical consequence of financed technological projects of cooperation throughout the IBEROEKA program (see details at Fig. 5).



**Fig. 5. Motives for inter-firm cooperation on R&D and innovation (N= 56)**

Opposite to the literature on the motives for technological cooperation (Hagedoorn, 1993; Bayona, García-Marco & Huerta, 2003), it is observed that the access to the market (economic reasons) for the Spanish firms prevails over the technological reasons (focused in R&D tasks more than in innovation activities).



### 5.3 Cooperation process

#### *Partners and types of activities cooperation on R&D and innovation*

Client and supplier firms are the preferred partners to cooperate, with similar percentages in both countries: 13 Spanish and 3 Argentine companies in the first case, and 12 Spanish and 2 Argentine firms, respectively. Other activities in order of importance are the joint R&D tasks and the transference of technology (in both senses). (**Table 5**). The principal reason for the partner election have been the firm's strategy for access to new markets (5 Argentine and 19 Spanish firms, respectively), followed by the existence of the firm that could offer the solution to a punctual technologic problem (2 Argentine and 15 Spanish firms) and cultural affinity (3 Argentine and 13 Spanish firms).

R&D and innovation activities realized in cooperation	Argentine firms N=17	Spanish firms N=39	Total (N= 56)
Joint R&D tasks	8 (47.1%)	18 (46.2%)	26 (46.4%)
Knowledge transference (from Spanish to Argentine firms)	0	13 (33.3%)	13 (23.2%)
Engineering tasks	0	10 (25.6%)	10 (17.9%)
Knowledge transference (from Argentine to Spanish firms)	9 (52.9%)	0	9 (16.1%)
Commercialization improvement	0	7 (17.9%)	7 (12.5%)
Software acquisition	0	6 (15.4%)	6 (10.7%)
Capital Adquisición de bienes de capital	0	6 (15.4%)	6 (10.7%)
Formation (capability improvement)	0	4 (10.3%)	4 (7.1%)
Hardware acquisition	0	4 (10.3%)	4 (7.1%)
Consultancy	0	3 (7.7%)	3 (5.4%)
Organization improvement	0	3 (7.7%)	3 (5.4%)
Industrial design	0	3 (7.7%)	3 (5.4%)

**Table 5. R&D and innovation activities realized in cooperation**

As it is observed in **Table 5**, the innovation activities are more diversified in the case of the Spanish firms and the technology transference occurs in both senses.

#### Agreement types and cooperation frequency

There are 44 cases of formal agreement between the firms (78.6%). Within the IBEROKA program the common type of agreement has been the joint investment (35 firms). Also it is the most habitual at international level, where the local company contributes with capital or knowledge and for facilitating the access to the market, while the foreign company contributes with capital, brand image or technology. As regards overseas cooperation frequency, only the third part declares cooperating in continuous form (19 firms, the 33.9%) while 24 firms have cooperated only one time (42.9%). (**Table 6**).

Cooperation frequency on R&D and innovation	Argentine firms N=17	Spanish firms N=39	Total
Continuous	0	19 (48.7%)	19 (33.8%)
More than 5 times	1 (5.9%)	2 (5.1%)	3 (5.4%)
2 to 5 times	3 (17.6%)	7 (17.9%)	10 (17.9%)
One time	13 (76.5%)	11 (28.2%)	24 (42.9%)

**Table 6. Cooperation frequency on R&D and innovation**

**Table 7** details the types of public support for financing R&D and innovation firms' activities. The 53.6% of Spanish firms and approximately the half of the Argentine sample (8 companies, the 20.5%) have perceived some type of public support for cooperation by the state (and Europe in the Spanish firms cases). Although apparently these percentages have certain relevance, the real conditions of financing are very different in both countries. Argentine is in a more unfavorable situation, by the general weak conditions of support to the financing of the innovation activities and a context of major macroeconomic instability. In Argentina the financing of the innovation activities depends essentially on the own development firms' efforts (Kosacoff, 2007).

Public support for cooperation on R&D and innovation	Argentine firms N=17	Spanish firms N=39	Total (N= 56)
State	6 (35.3%)	24 (61.5%)	30 (53.6%)
Europe	-	8 (20.5%)	8 (20.5%)
IBEROEKA Program	7 (41.2%)	28 (71.8%)	35 (62.5%)

**Table 7. R&D and innovation public supporting**

#### 5.4 Obstacles and barriers for the international inter-firm cooperation on R&D and innovation

Inter-firm networks are frequently seen as facilitators of innovation by being sources of ideas, information and resources. They can, however, act as obstacles to innovative cooperation due to technical, knowledge, social and administrative dependencies. In this sense, we can distinguish between internal barriers, at level firm, from external obstacles. According to the information obtained by the telephonic interviews the main difficulties are focused in the initiation of the cooperation process, the search of partners and negotiation. In some particular sectors –Chemical industries- the existence of significant differences in normative and regulation conditions is an important obstacle for cooperation. At the firm level, the principal obstacle has been the time with respect to the concretion of results (14 companies, 25%), followed by the lack of fulfillment and the quality of human resources (**Table 8**).

Obstacles at firm level	Argentine firms N=17	Spanish firms N=39	Total (N=56)
Time with respect to the concretion of results	7 (41.1%)	7 (17.9%)	14 (25.0%)
Lack of fulfillment or infringement by the other party	1 (5.9%)	3 (7.7%)	4 (7.1%)
Lack of suitable human resources	1 (5.9%)	3 (7.7%)	4 (7.1%)

**Table 8. Barriers to cooperation on R&D and innovation at firm level**

Difficulties of access to the financing and the macroeconomic instability, followed of the lack of governmental support and the distance are distinguished as the principal global obstacles. These results agree with the empirical evidences obtained in other countries (Heijs & Buesa, 2006).

#### 5.5 Results of the cooperation experience: differences between Argentine and Spanish firms

##### *Economic and technological results*

Another aspect studied in our survey is the one referring to the results of innovation obtained by the firms, including economic and technological/innovation results. Like indicators of technological results we have considered the percentage of companies that obtain product or process innovations; also the occurrence of

commercialization and organizational innovations and patents and the licenses obtained by the firms (**Table 9**).

Cooperation results	Argentine firms N=17	Spanish firms N=39	Total
<b>Product</b>			
Product improvements	3 (17.6)	9 (23.1%)	24 (42.9%)
New product introduction	3 (17.6)	23 (59.0%)	25 (44.6%)
Patent (product)	1 (5.9%)	1 (2.6%)	2 (3.6%)
<b>Market</b>			
Market expansion	2 (11.8%)	17 (43.6%)	19 (33.9%)
Market openness	3 (17.6)	13 (33.3%)	16 (28.6%)
<b>Process</b>			
Increasing of the productive capacity	0	13 (33.3%)	13 (23.2%)
Costs reduction	1 (5.9%)	6 (15.4%)	7 (12.5%)
Improvement of human resources	1 (5.9%)	3 (7.7%)	4 (7.1%)
Patent (process)	0	0	0
Organizational improvement	0	2 (5.1%)	2 (3.6%)

**Table 9. Results of the inter-firm cooperation**

#### *Firm satisfaction with the cooperation experiences*

Respondents have been asked to estimate the degree to which specific benefits from their cooperation were achieved. Results show that the Spanish companies have a more optimistic opinion than the Argentine one. If we considered the fulfillment of the cooperation objectives, 13 Spanish firms (33.3%) and only 1 Argentine affirm that they have been fulfilled totally while 15 Argentine Spanish firms (38.5%) and 3 Argentine firms (17.4%) affirm that they have been partially fulfilled. Although the half of the companies declares to cooperate frequently and to be satisfied with the cooperation experience with cooperation, the degree of importance attributed to the carried out innovation activities is described like "high" only by 10 Spanish companies (25.6%) and 4 Argentine (23.5%) (**Table 10**).

Importance level of the innovation activities in cooperation	Argentine firms N=17	Spanish firms N=39	Total N= 56
High	4 (23.5%)	10 (25.6%)	14 (25.0%)
Medium	3 (17.6%)	10 (25.6%)	13 (23.2%)
Low	0	8 (20.5%)	8 (14.3%)
Irrelevant	1 (5.9%)	0	1 (1.8%)
<b>Cooperation results</b>			
Firm decides the renovation of the cooperation agreement	5 (29.4%)	12 (30.8%)	17 (30.4%)
Deepening the cooperation bonds	6 (35.3%)	12 (30.8%)	18 (32.1%)
New knowledge was incorporated to the firm	5 (29.4%)	10 (25.6%)	15 (26.8%)
The firm profits have been incremented	2 (11.8%)	9 (23.1%)	11 (19.6%)
Patenting/licensing	1 (5.9%)	3 (7.7%)	4 (7.1%)
<b>Firm choose to cooperate again</b>			
Yes	9 (52.9%)	26 (66.7%)	35 (62.5%)
No	8 (47.1%)	13 (33.3%)	21 (37.5%)

**Table 10. Importance level of the innovation activities in cooperation**

## **6. Conclusion**

This study attempts an approach to the phenomenon of the cooperation on R&D between Argentine and Spanish firms, analyzing its interrelationships but mainly trying to evaluate the quality of the interactions. The

first relevant result is the confirmation of difficulties that the international inter-firm cooperation on R&D and innovation is not easy to take ahead. Of more of a hundred of companies that have responded and have been chosen by the probability of being innovating and to carry out cooperation activities, only 56 firms have cooperated, 39 in Spain and 17 in Argentina. Although a percentage next to 50% of these companies has participated in a public program oriented to promote the cooperation and has counted with certain support of financing, only 35 have been engaged in cooperation activities. The Argentine firms seem to have less experience in cooperation activities than Spanish firms. In addition, the most unfavorable conditions in the financing and the more unstable macroeconomic context explain, in part, the smaller number of Argentine firms that have cooperated.

The information obtained contributes to a better understanding about inter-firm cooperation in two countries on which the literature and empirical evidence is scarce. This deficiency in the literature is more accentuated in relations to SMEs of high and medium technological intensity, profile that corresponds with our findings. In this sense, results show that not only the big companies can obtain majors advantages in the international market and in the international opportunities for innovation. Contrary with the literature on motives for the technological cooperation, it represents for the Argentine and Spanish SMEs opportunities from access to new markets, the launching of new products and the commercialization improvement. Around the fifty per cent of the Spanish firms have cooperated of continuous way whereas more of 75% of the Argentine firms declares have done it only in an occasion

Globally, the study shows that there are some significant differences in the forms of cooperation in both countries according the firm specific characteristics (size, sector of activity, innovation strategies, R&D and innovation activities types). The differences in the financial mechanism of supporting the R&D and innovation activities between Spanish and Argentine firms constitute an important barrier to cooperation. The asymmetrical distribution and conditions of the financial supporting in the IBEROEKA programme – information obtained throughout the interviews- is other relevant obstacle for the success of cooperation initiatives.

The cooperation impact is more positive for the Spanish firms that for the Argentine firms. Argentine firms seem to be less optimistic respect the cooperation experiences. The third part of the sample is disposed to renew the cooperation agreements and only in a few cases it considers that the cooperation has served to incorporate new knowledge and to increase the profits of the firm. The R&D and innovation internationalization constitutes a challenge and a great opportunity for the companies and, particularly, for the SMEs in high and medium high technological sectors

But, as it is demonstrated in this study, the cooperation does not seem to influence significantly in the increase of the firm innovating capacity. Also neither can serve like an instrument to surpass the obstacles in innovation systems that are characterized by their weakness. The policies of support for the inter-firm cooperation on R&D and innovation would have to consider the differences that affect to the cooperation in both countries according to the firm specific characteristics and their particular conditions of financing.

## **7. Contributions & implications**

The contribution of this paper is twofold. To our knowledge and although the extensive empirical literature related to inter-firm cooperation, this is the first paper that explores this scope between Argentine and Spanish firms. In this sense, the paper aims to provide a major knowledge about different forms of cooperation and contributes with empirical evidence on the identification of the barriers which can affect significantly the inter-firm cooperation on innovation and R&D relationships. Both aspects have significant implications for governmental policies in this area in the specific contexts of Argentina and Spain.

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## ANNEX

### Spearman's Rank Correlation Coefficient

Variables	Age/experience	Firm size	Technological intensity
Age/experience			
Firm Size	<b>-,344 (*)</b>		
Technological intensity high	<b>-,362 (**)</b>	-,122	
<b>Cooperation partners</b>			
Supplier	,263	<b>-,404 (**)</b>	-,139
<b>Client</b>	<b>,340 (*)</b>	<b>-,330 (*)</b>	-,166
Competitor	,238	<b>-,274 (*)</b>	-,047
Other sector firm	-,012	-,151	,013
University/research institute	,035	-,081	-,181
<b>Motives to cooperate</b>			
Commercialization improvement	-,004	-,196	<b>,356 (**)</b>
Improvement of productive process	,113	-,221	-,159
Access to resource	-,111	,080	-,030
New product introduction (at level firm)	<b>,368 (**)</b>	-,219	-,203
New product introduction (at market)	,037	-,100	-,115
Technology sourcing	,236	-,072	-,080
Access to new markets	,072	-,213	,224
Organizational improvement	-,174	-,033	-,050
<b>Motives to cooperation on R&amp;D and innovation</b>			
Increasing sales	,037	<b>-,269 (*)</b>	,079
Market advantage	,110	<b>-,335 (*)</b>	-,050
Improvement of the distribution chain	,146	-,230	-,063
Access to resources	-,009	,090	<b>-,332 (*)</b>
Improvement of productive process	,042	-,191	-,092
Logistic improvement	-,165	-,153	,161
Punctual technical problem solution	-,016	-,244	,096
Technical assistance	,061	<b>-,345 (**)</b>	,047
Joint R&D tasks	-,002	<b>-,294 (*)</b>	,077

\* 0,05 Significance level (bilateral).

\*\* 0,01 Significance level (bilateral).