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Patterns and barriers for innovation and R&D cooperation between
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Patterns And Barriers For Innovation And R&D Cooperation Between Argentine And Spanish Firms

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Abstract

This paper examines co-operative innovation and research and development (R&D) behaviour between Argentine and Spanish firms. Based on theoretical perspectives from the literature, we surveyed a sample of 540 Argentine and Spanish firms believed to have cooperated for technological innovation. We present empirical evidence based on 104 firms of patterns of cooperation in several processes and out-puts, highlighting firm characteristics, the motives of the collaborating parties, types of partners and R&D and innovation activities, leadership, and obstacles to cooperation. Our results reveal that the determinants of success differ considerably among countries depending on the sector, the firm specific characteristics and funding. These differences have important implications for public policy and instruments to support R&D and innovation activities.

Keywords

innovation, R&D; international cooperation; cooperation types; barriers; government funding programmes.

1 Introduction

Knowledge creation and networking are increasingly at the international level and are accompanying the emergence of global patterns of R&D and innovation (Archibugi & Iammarino, 2002; Criscuolo, 2004; Narula & Duysters, 2004; Edler, 2007). Current evidence on R&D flows suggests that the global innovation environment has changed due to more intense global competition and the need to innovate more quickly and on a different scale. The internationalization of R&D and innovation stems from: the complexity of global competition with the advent of new, more differentiated products and producers; institutional change as a result of liberalization; the impact of information and communication technologies (ICT); transformations in markets, competition and industrial organization; and adjustments in corporate strategies and business models (Ernst, 2005; OECD, 2008).

According Pérez (2008) the process of globalization has resulted in the segmentation of three key areas: value chains, global markets and technological capabilities. Each of these areas has become a complex network with differentiated components. This can be described as *integrated decentralization or systemic componentization*, a process in which every component has a high degree of autonomy within an inter-functional and interactive structure. These new scenarios have affected the need for firms to collaborate with other agents in the innovation system, particularly in capital- and knowledge-intensive sectors. The increasing costs and risks associated with innovation have led firms to see cooperation as the best option in many instances (Narula & Duysters, 2004). In addition, cooperation between the state, university and private sectors, and as inter-firm, has become a key strategy in the innovation processes. Several analyses in the literature on innovation systems (among others Lundvall, 1992

and Nelson, 1993) stress that national specificities of patterns of interaction are at the core of what defines a national innovation system.

Our work is closely related to all these issues and explores the extent to which Spanish and Argentine firms engage in co-operative cross border R&D and innovation, and attempts to identify the barriers to cooperation between firms in both countries. The paper is structured as follows: Section 2 provides the literature review and sets out the main aspects involved in inter-firm R&D and innovation cooperation. Section 3 presents the research questions. Section 4 describes the sample and methodology used; Section 5 presents the results and Section 6 offers some conclusions. Section 7 describes the contributions and implications of this study.

2 Theoretical background and literature review

Various authors provide extensive reviews on the phenomena of cooperation and establishment of international alliances, analysing their evolution from 1960 (Hagedoorn, 2002; Hagedoorn & Osborn, 2002; Narula & Duysters, 2004). The literature focuses on four areas: the reasons for cooperation; selection of partners; alliance management (control, conflicts, fulfillment of the alliance objectives, leadership); and the impact of the cooperation (results) (Bayona, García-Marco & Huerta, 2001; Vonortas et al., 2003; Lundin, Frinking & Wagner, 2004).

There are several definitions of international cooperation involving R&D and innovation, which are considered to be the “*the relation between different organizations based on innovation with a certain content of R&D*” (Hagedoorn, Link & Vonortas, 2000). In general, international cooperation on R&D and innovation is seen as a strategic decision that implies the transfer of knowledge (*know how*) between partners located in different countries (Barajas & Huergo, 2006). The decision to cooperate goes

beyond the selection of a foreign partner and involves the company becoming familiarized with an environment that is different from its habitual one, which may have implications for the management of innovation resources and activities.

Research on understanding international inter-firm cooperation on R&D and innovation can be grouped into four representative strands:

- **Market-power theory (MPT)**, concerned with the ways in which firms can improve their competitive success by securing stronger positions in their markets (Porter, 1980; Child & Faulkner, 1998).
- **Transaction Cost Theory**, related to the cost of participating in a market and making an economic exchange (Teece, 1987; Brockhoff, 1992);
- **Strategic Management Theory**, which analyses the interrelationship between technological cooperation and corporate strategy (Dodgson, 1992; Child & Faulkner, 1998);
- **Industrial Organization Theory**, which focuses on the study of firms' strategic behaviour, and the structure of markets and their interactions, and pays attention to the generation of spillovers (Gassmann & von Zedtwitz, 1999; Hagedoorn, Link & Vonortas, 2000).

Other theoretical perspectives include Social Exchange Theory (Das & Teng, 2002), Resource-Based Theory (Conner & Prahalad, 1996; Combs & Ketchen, 1999) and game theory (Sanna-Randaccio & Veugelers, 2001; Eriksson, 2007; Binenbaum, 2008). In what follows (Table I), we provide a brief explanation about the principal aspects considered by the literature (**Table 1**).

Topics	Researchers
<p><i>Firm size.</i> Although there is no consensus in the literature, most authors assume a positive correlation between firm size and cooperation in R&D, and innovation intensity.</p>	<p>Molero (1998); Bayona, García-Marco & Huerta (2001); Hidalgo Nuchera & Albors Garrigós (2004); Narula (2004)</p>
<p><i>Firm age & experience</i> Previous experience and age of the firm are positively correlated to participation in cooperation on R&D and innovation.</p>	<p>Molero (1998); Fritsch & Lukas (2001)</p>
<p><i>Motives for cooperation.</i> Hagedoorn (1993) lists the motives for cooperation as:</p> <ul style="list-style-type: none"> ▪ related to basic and applied research and some general characteristics of technological development (minimizing and sharing of uncertainty in R&D, reduction in and sharing of costs of R&D). ▪ related to real innovation processes (capturing partner's tacit knowledge of technology, technology transfer, technological leapfrogging, shortening the product life cycle, and the period between invention and market introduction). ▪ related to market access and opportunities (internationalization and entry to foreign markets, new products and markets, expansion of product range).. 	<p>Hagedoorn (1993), Bayona, García-Marco & Huerta (2001); Nooteboom (1999); Narula (2002, 2004); Tether (2002); Vonortas et al. (2003); Kauser & Shaw (2004); Montoro, Mora & Guerras (2006)</p>
<p><i>Activity sector & technological intensity.</i> In the case of small and medium sized enterprises (SME), the extent and intensity to which they can use collaboration varies by the maturity of their primary technologies. Some firms operate in sub-sectors that are increasingly paradigmatic and mature, others are pre-paradigmatic and nascent.</p>	<p>Molero (1998); Hagedoorn (1993); Narula (2002); Lundin, Frinking & Wagner (2004)</p>
<p><i>Cooperation agents</i> Include the type of partner (other firm, university, research institute) and the reasons for their selection. Cooperation may be horizontal (between competitors) or vertical (customer, supplier), intra or inter-sectorial.</p>	<p>Dussauge, Garrette & Mitchell (2000); Fritsch & Lukas (2001); Lundin, Frinking & Wagner (2004); Montoro, Mora & Guerras (2006)</p>
<p><i>Agreement types</i> Formal, informal, joint venture, equity and non-equity agreements, etc.</p>	<p>Hagedoorn (1990); Narula & Hagedoorn (1999); Nooteboom (1999); Lundin, Frinking & Wagner (2004)</p>
<p><i>Cooperation process</i> Includes management of the agreement, initiation of contacts between firms, project management, organizational climate, leadership, etc.</p>	<p>Hagedoorn (1993); Khanna, Gulati & Nohria (1998); Nooteboom (1999); López (2008). (Hoffman & Schlosser, (2001); Gerwin &</p>

	Meister, 2002; Kauser & Shaw, 2004)
<i>Regulatory conditions & funding</i> Governments can facilitate (or not) international collaboration through financial support and easing of the regulatory conditions that restrict the potential for cooperation. Most international activities take place within established international networks and programmes. In general, there are more multilateral programmes and international instruments are not integrated with national strategies	Nooteboom (1999); Hidalgo Nuchera & Albors Garrigós (2004); Lundin, Frinking & Wagner (2004)
<i>Barriers to cooperation</i> There are several barriers: financial restrictions, lack of suitable human resources, problems of appropriability of the results among partners, additional costs and time of cooperation, finding suitable partners, coordination/communication problems, conflicts of different interests, etc.	Hladik (1988); Hagedoorn (1993); Dodgson (2002); Hidalgo Nuchera & Albors Garrigós (2004); Tiwari & Buse (2007); Teixeira, Santos & Brochado (2008)
<i>Results & impact of cooperation</i> Economic and technological improvements, including the effects of technological spillovers, the development of new products, the development of/improvements to new or existing processes, exploitation of complementary resources, acquisition/creation of new knowledge, etc.	Cassiman & Veugelers (1999); Hagedoorn & Schakenraad (1994); Criscuolo (2004); Kauser & Shaw (2004)

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 on the cooperation relationship between Spanish and Argentine firms, based on the items in **Table 1** and, particularly:
- to identify barriers that could influence inter-firm cooperation on R&D and innovation between Spain and Argentine.

Some limitations of this study due the innovation landscapes in the countries studied are presented 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 SME and few large companies
 - Little development of risk capital
 - Principal innovation strategies: in Argentina R&D acquisition (*external R&D*) and in Spain in house R&D
 - Innovative firms in Spain cooperate over innovation less than other European countries
 - Cooperation is not relevant for the majority of Argentine firms
-

Table 2. Argentine and Spanish innovation landscape. Sources: INDEC (2008), INE (2009) and EUROSTAT (2010)

Regarding these limitations and the lack of databases on inter-firm cooperation in both countries, we consider the particular case of firms that we believe have been involved in cooperation (firms that have participated in international cooperation programmes, and exporting firms). Although our analysis is related primarily to technology cooperation, we consider both technological and non-technological innovation activities performed by the firms.

4 Methodology & sample

We elaborated a database containing 540 innovative firms from Spain and Argentina to administer a survey which received a response rate of 20.2%. A significant percentage (47%) of the surveyed enterprises had participated in a government programme called IBEROEKA, a political instrument that was introduced in 1991 to reinforce industry competitiveness in 21 IberoAmerican countries through scientific and technological cooperation among innovative enterprises and other actors (Hidalgo & Albors, 2004; Hidalgo et al., 2006)¹. Additional information on other firms was obtained from the Spanish Institute for Foreign Trade (Instituto Español de Comercio Exterior, ICEX)

¹ We collected data from Argentine and Spanish participants in IBEROEKA projects during 1991-2008.

database. The survey was administered by mail and online and was complemented by information obtained through telephone interviews.

The questionnaire included with multi-item and closed and open-ended questions. It includes 51 questions and the questionnaire has three parts, as follows:

- **Part 1** collected data on firm background and general characteristics (size, sector and branch of activity, human resources, etc.).
- **Part 2** asked about the firm's general experience with cooperation on innovation and R&D (motives of the collaborating parties, modes of cooperation, types of partners, previous experience of cooperation with firms, universities, research institutes and other agents, forms of agreements and expected outcomes, investments and public support for innovation activities, and results of cooperation).
- **Part 3** collected data on cooperation relationships between Spain and Argentina, focusing on in-puts, out-puts and the cooperation process.

5 Results

5.1 *Firms' characteristics*

The majority of Spanish companies claimed to be innovators (53 out of 56 firms, 94.6%) and were in favour of cooperation (51 or 91.1%). 70% of Spanish firms that cooperated with other firms in the last three years (39 firms). The results for Argentina are less favourable to cooperation: 20 out of 48 firms are innovators (41.7%) and 21 had cooperated with other companies (43.8%). Only 17 Argentine companies had cooperated over R&D and innovation with Spanish companies, which is only just over a third part of the companies in our sample (35.4%) (**Figure 1**). 80.4% (45 companies)

are involved in exporting, with the percentage similar for both countries (12 out of 17 Argentine firms and 33 out of 39 Spanish firms, 70.6% and 84.6% respectively).

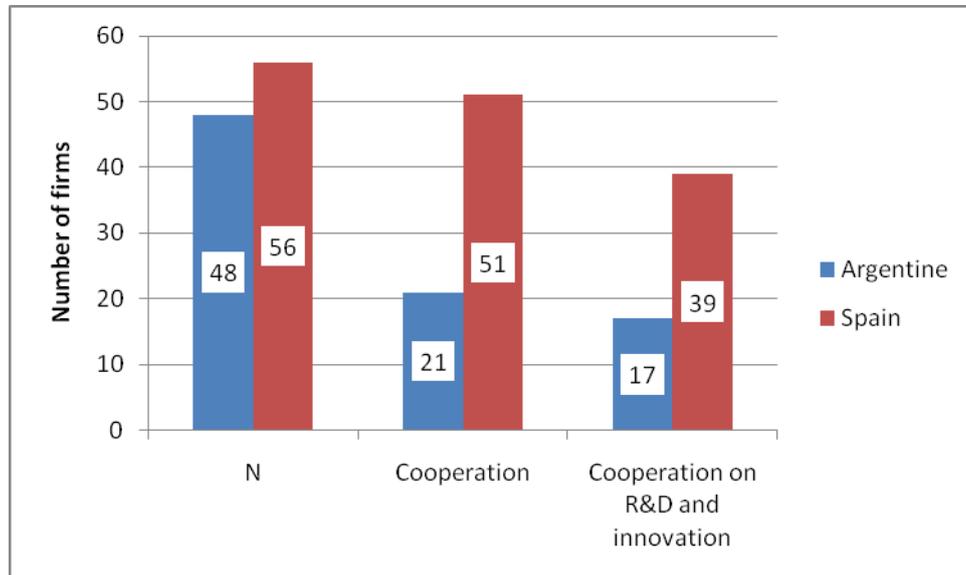


Figure 1. Cooperation between Argentine and Spanish firms

Firm size

SME are the main collaborators: 14 out of 17 Argentine companies (82.4%) and 26 out of 39 Spanish firms (66.7%). None of the large Argentine companies in the sample had been involved in cooperation and only 5 from the Spanish sample (8.9%) had collaborated. These results are in contrast to those in the literature, which highlights big companies as being the main collaborators based on presence in the market and high level of R&D intensity (Hagedoorn & Schakenraad, 1994; Vonortas, 1997; Tether, 2002). Also empirical work on Spain shows similar results (Buesa & Molero, 1998; Fonfría, 1998; Bayona, García-Marco & Huerta, 2001; López, 2008).

Age

In general, younger companies are more keen to cooperate: more than half of those in the sample had been established for less than 20 years and a third had been in existence

for only 10 years. The highest frequency of cooperation is among companies aged 20 to 50 years old, and percentage involved in collaboration among companies more than 50 years old is only 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 distribution of firms according to sector of activity. ICT is the most represented sector in the sample with 24 companies (42.9% of the sample). It is also one of the main sectors involved in IBEROEKA (Alderete, 2007; CDTI, 2009. IBEROEKA's first programme was CYTED (Science and Technology for the Development) launched by the Spanish Government and the Economic Commission for Latin America (CEPAL) to improve technological cooperation between firms in Spain, Portugal and Latin America (see <http://www.cyted.org/>).

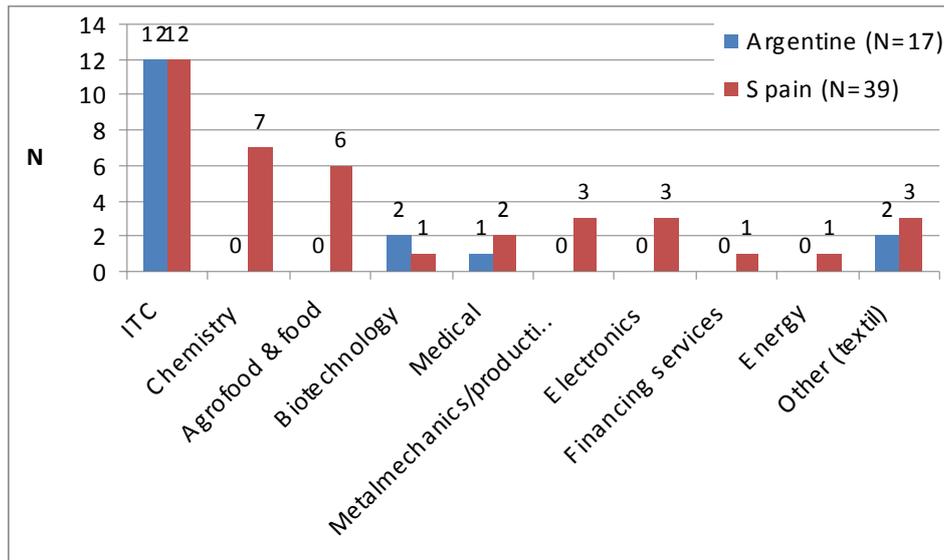


Figure 2. Argentine and Spanish firms

The 76.8% of the companies that have cooperated are of high and medium-high technological intensity and only 23.2% are low and low-medium intensity firms. This trend is especially strong for the Argentine firms (Table 4). This is in line with the literature on SME and innovation activity in certain sectors and technologies. Two examples of high innovation performance among SME are born *globals* and SME participation in the EC 7th Framework Programme (FP7), where SME outshone large 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 to firm motives for cooperation with other firms, the first is access to new markets, followed by better commercialization and distribution and the introduction of new products to the market. Other reasons include introduction of a technology new to the company and improvements to the productive process (through a new quality system, stock reduction, etc.). Access to resources and organizational improvements seem to be less important (**Figure 4**).

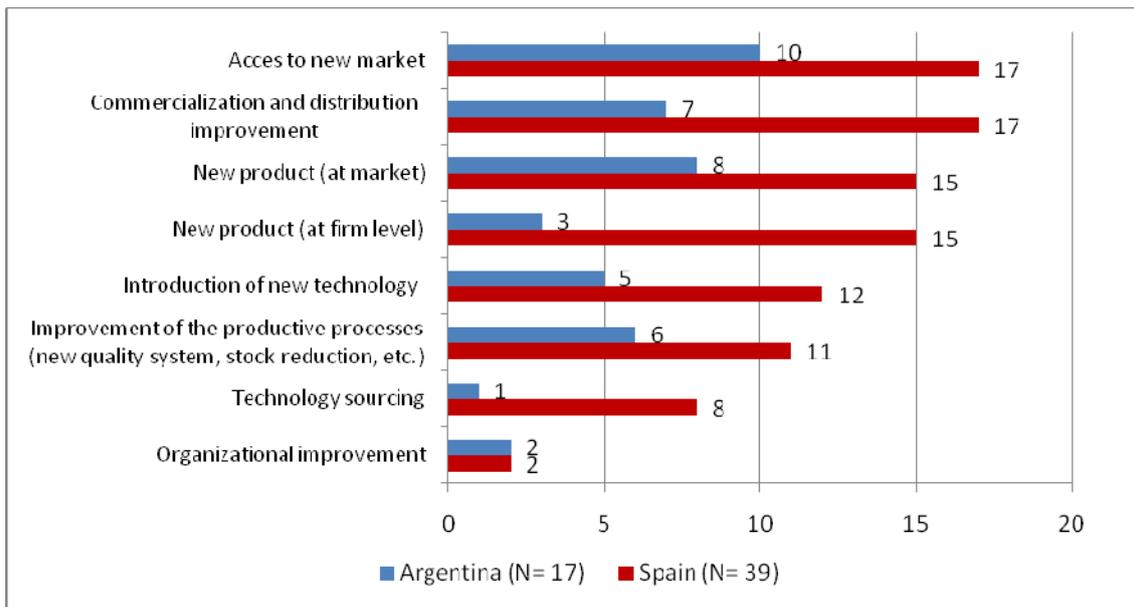


Figure 4. Motives for general cooperation between Argentine and Spanish firms (N= 56)

Motives for cooperation over R&D and innovation

The first strategy is entering new markets (27 companies cited this as the main reason in order to increase sales/exports). Joint R&D tasks, technology complementarity, technical assistance and the rapid technical problem solving are other important motives for cooperation, as a logical consequence of technological cooperation projects financed through the IBEROEKA programme (see details at **Figure 5**).

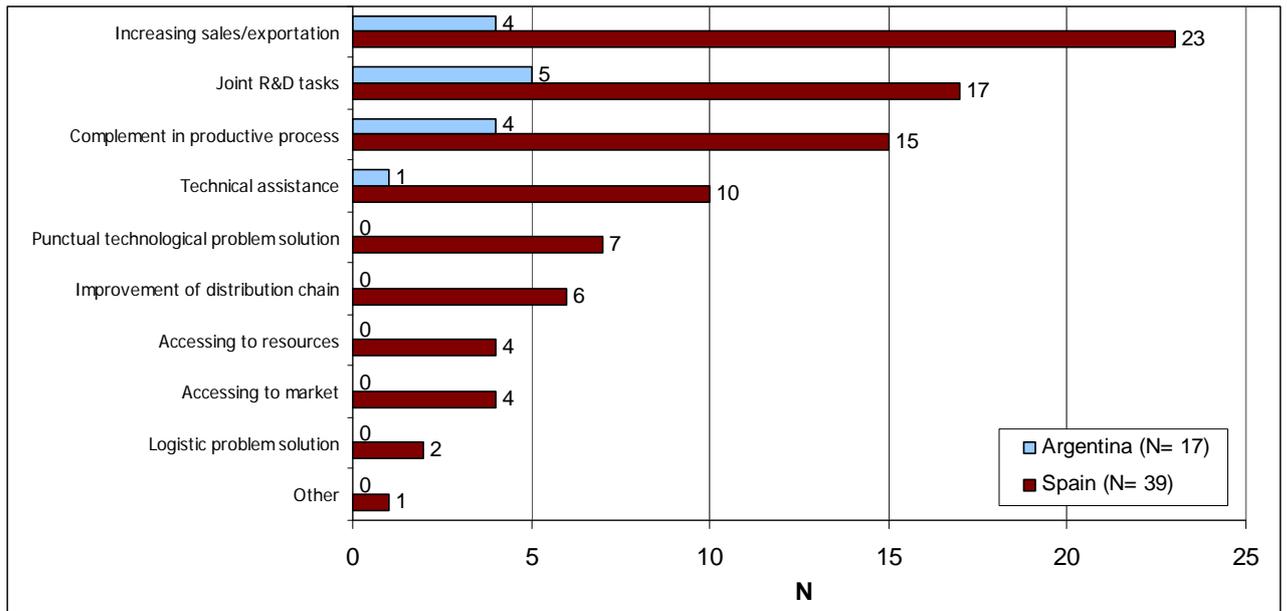


Figure 5. Motives for inter-firm cooperation on R&D and innovation (N= 56)

In contrast to the literature on motives for technological cooperation (Hagedoorn, 1993; Bayona, García-Marco & Huerta, 2003), we observe that access to markets (economic reasons) for Spanish firms is more important than technological reasons (greater focus on R&D than innovation).

5.3 Cooperation process

Partners and types of cooperation activities involved in R&D and innovation

Client and supplier firms are the preferred partners for cooperation, with similar percentages for both countries: 13 Spanish and 3 Argentine companies, and 12 Spanish and 2 Argentine firms, respectively. Other activities in order of importance are joint R&D tasks and technology transfer (Table 5). The principal reason for the selection of partners is access to new markets (5 Argentine and 19 Spanish firms), followed by the solutions to technological problems (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%)
Machinery acquisition	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

Table 5 shows that innovation activities are more diversified in the case of Spanish firms and that technology transfer is important for both countries' firms.

Agreement types and cooperation frequency

There are 44 cases of formal agreements between firms (78.6%). Within the IBEROKA programme the most common type of agreement was joint investment (35 firms). It was also the most frequent at the international level, where the local company contributes with capital or knowledge and facilitates access to the market, while the foreign company contributes with capital, brand image or technology. As regards overseas cooperation frequency, only around a third of firms were involved in continuous cooperation (19 firms, 33.9%) while 24 firms have engaged in cooperation only once (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

Public financing support for inter-firm cooperation on R&D and innovation

Table 7 presents the types of public support for financing R&D and innovation activity. 53.6% of Spanish firms and approximately the half of the Argentine sample (8 companies, 20.5%) received some type of public support for cooperation from the state (and Europe in the case of Spanish firms). Although these are reasonable percentages, real financing conditions differ widely between countries. Argentina is in a less favourable situation due to the generally weak funding support for innovation and the major macroeconomic instability. In Argentina financing of innovation activities depends essentially down to the individual firms (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 Programme	7 (41.2%)	28 (71.8%)	35 (62.5%)

Table 7. R&D and innovation public supporting

5.4 Barriers to international inter-firm cooperation on R&D and innovation

Inter-firm networks are frequently seen as facilitating innovation by being sources of ideas, information and resources. They also can be obstacles to innovation cooperation for technical, knowledge, social and administrative reasons. We can distinguish between

internal firm level barriers, from external obstacles. According to the information obtained via the telephone interviews the main difficulties are initiation of the cooperation process, search for partners, and negotiation of agreements. In some sectors –the Chemical industry- the existence of significant differences in normative and regulation conditions is an important obstacle to cooperation. At firm level, the principal obstacle is time taken to produce firm results (14 companies, 25%), followed by non compliance with the cooperation contract, and the inadequacy 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 related to accessing finance and macroeconomic instability, followed by lack of government support and distance between partners were identified as the main obstacles. These results agree with empirical evidence for other countries (Heijs & Buesa, 2006).

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

Economic and technological results

We also analysed the results of cooperative innovation obtained by the firms, including economic and technological/innovation results. Similar to the indicators for technological results we considered the percentage of companies that obtained product

or process innovations, and the frequency of commercial and organizational innovations, and patents and the licences (**Table 9**).

Cooperation results	Argentine firms N=17	Spanish firms N=39	Total
Product			
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%)
Market			
Market expansion	2 (11.8%)	17 (43.6%)	19 (33.9%)
Market openness	3 (17.6)	13 (33.3%)	16 (28.6%)
Process			
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 were asked to estimate the degree to which the specific benefits from cooperation were achieved. Results show that Spanish companies are more optimistic in this regard than Argentina's firms. If we consider satisfaction in terms of cooperation objectives, 13 Spanish firms (33.3%) and only 1 Argentine were totally satisfied while 15 Argentine Spanish firms (38.5%) and 3 Argentine firms (17.4%) declared being only partially satisfied. Although half of the companies in the sample said they cooperated frequently and were satisfied with the cooperation experience the degree of importance attributed to the innovation activities involved was described as "high" by only 10 Spanish companies (25.6%) and 4 Argentine (23.5%) firms (**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%)
Cooperation results			
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%)
Firm choose to cooperate again			
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 looked at the phenomenon of cooperative R&D involving Argentine and Spanish firms, and its interrelationships in order to evaluate the quality of the interactions. We find that the difficulties involved in international inter-firm cooperation over R&D and innovation activity is not straightforward. Of the more than 100 companies that responded to our survey, chose from a sample of firms most likely to have been involved in innovation and cooperation, only 56 firms had cooperated, 39 in Spain and 17 in Argentina. Although nearly half of these companies had participated in a public programme designed to promote cooperation and received financial support, only 35 had engaged in cooperation activities. Argentine firms have less experience of cooperation than do Spanish firms explained in part by the less favourable financing conditions and the less stable macroeconomic context. Around 50% of Spanish firms

cooperate more or less continuously, while 75% of Argentine firms had cooperated only once.

The information obtained contributes to a better understanding of inter-firm cooperation in two countries which have been overlooked by research and on which empirical evidence is scarce. This applies especially to high and medium technological intensity SME. We also show, and in contrast to the literature on the motives for technological cooperation, that for the SME in both the countries studied, opportunities from access new markets, launching new products and greater commercialization are major reasons for cooperation. Overall, this study shows that there are some significant differences in the forms of cooperation which are based on firm characteristics (size, sector of activity, innovation strategies, R&D and innovation activities). Differences in the financial mechanisms for supporting R&D and innovation between Spanish and Argentine firms are an important barrier to cooperation. Information from interviewees shows that the asymmetric distribution and conditions of financial support within the IBEROEKA programme is another major obstacle to successful cooperation initiatives.

The impact of cooperation is more positive for Spanish than for Argentine firms. The latter are less optimistic about the cooperation experience. Thirty per cent of the sample is disposed to renew the cooperation agreements and only in only a few cases had cooperation resulted in new knowledge and increased profits for the firm. Internationalization of R&D and innovation constitutes both a challenge and an opportunity for companies and particularly for SME in high and medium high technological sectors. However, this study demonstrates that cooperation does not seem to make a significant difference to firms' innovation capacity. It also does not help to overcome weaknesses in innovation systems. Policy to support inter-firm cooperation on R&D and innovation should consider the differences that affect cooperation in Spain

and Argentina based on firm specific characteristics and the particular conditions of financing.

7 Contributions & implications

The contribution of this paper is twofold. To our knowledge and despite the extensive empirical literature on inter-firm cooperation, this is the first investigation of cooperation between Argentine and Spanish firms. It makes a major contribution to the knowledge on different forms of cooperation and provides empirical evidence on the barriers to inter-firm cooperation in innovation and R&D relationships. Both aspects have significant implications for government policy in this area in the specific contexts of Argentina and Spain.

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