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LEARNING AND INNOVATION
IN SPACE

Edited by
Arne Isaksen, James Karlsen, Marta Gancarczyk

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Contents

From the Editors

Spatial proximity, observed in local and regional territorial units, has lately been questioned as a necessary condition for interactive learning among actors and for generating innovations, due to both information and communication technologies and globalizing communities of practice. Instead, cognitive, social and institutional proximity is increasingly considered a prerequisite to exchange knowledge and conduct complex innovation projects either on local, regional, national or international scales. On the other hand, it needs to be acknowledged that these other types of proximity are to a large extent created and shaped by the participation in networks. Networks, in turn, can either be a-spatial, acting as virtual communities of interest or practice, or embedded in specific local and regional settings, sourcing from their human capital, culture and institutional structures. It can be posited that a network approach to interactive learning would bridge the a-spatial perspective on information and knowledge exchange with the spatial one that is rooted in specific geographical locations, where embedded links continue to play the role.

We observe this combination of perspectives on the example of the international cooperation among actors in diverse regional clusters that demonstrate socio-cultural, institutional and technological similarities. Another notable example is global 'brain circulation', when professionals and experts circle among a limited number of settings where high-class communities of practice generate new knowledge. The roles of local and international knowledge networks are also reflected in the entrepreneurial process. Local relationships often form a basis for the establishment of companies and relationships normally continue to be local, due to low mobility of small and medium-sized enterprises. On the other hand, the company growth is often conditioned by the cross-border, international links to access technology and markets.

Therefore, our understanding of the importance of spatial conditions for companies' knowledge development and innovation processes is currently challenged – both by the question of local versus global assets and relations in regional innovation systems and by different spatial perspectives in the strategies of companies and in public policy directions. The collection of articles in this JEMI issue on 'Learning and Innovation in Space' addresses this challenge. Learning networks and innovation systems discussed here demonstrate different spatial contexts and they are approached with a variety

of theories and methodologies as well. They also provide relevant insights for strategies of enterprises and public decision-makers.

Three papers focus on regional aspects of learning, however they investigate different aspects of learning and innovation output. Marina Solesvik and Magnus Gulbrandsen aimed to find out whether cooperation between firms, universities and government increases the intensity of innovation equally for the capital city and peripheral regions in Norway. Their research framework is theoretically founded on triple helix perspective, local/regional innovation systems and open innovation approaches and tested based on data from the Community Innovation Survey.. The findings show no effect on innovation from cooperation with universities, but technological innovations prove to be related to public support. Capital region firms are generally not more innovative than those located elsewhere. The policy implication is that applying models of cooperation does not automatically translate into innovation outcome. Henar Alcalde Heras adopts the data from the National Innovation Survey for Basque firms to assess the impact of differing collaboration modes of domestic and foreign-owned firms on the level of innovation novelty. Her quantitative methodology reveals that innovation novelty is positively affected by a variety of partners in cooperation networks and by collaboration strategies that combine inter-regional networks with extra-regional, commercial-based ones. Determinants of university-industry cooperation in Apulia and Galicia regions are investigated by Manuel González-López, Ivano Dileo and Francesco Losurdo. They use a multiple – case study methodology and the analysis of literature and secondary sources to study the conditions and impediments to bridging the science and business communities. Resultant recommendations focus on a variety of areas, ranging from cultural and institutional spheres to the industrial structure and specialization of university research in the regions under study.

The papers by Milena Ratajczak Mrozek and by Agata Sudolska and Andrzej Lis assume an individual enterprise perspective on learning and innovation development. The first paper seeks to investigate the importance of locally embedded and personal relationships on the opportunities to internationalise and growth. The comparative analysis of two case studies reveals the critical impact of personal and international relationships in accessing new markets and growth-oriented operations of the companies researched. The other, conceptual paper, proposes a model of collaborative learning, built upon determinants separated into prerequisites and enhancers of the learning interaction. The authors recommend the model for operationalization and further empirical research. Both papers emphasize the importance of trust and mutual understanding of the partners in the learning and development

processes, thus confirming the influence of relational embeddedness that is normally shaped in a specific spatial context or in long-lasting networks.

We want to extend our thanks to the Authors and to the Reviewers for their contributions, believing that this issue of JEMI provides new evidence and adds to the literature on the relationships between learning, innovation outcome and geographical space.

Dr Hab. Marta Gancarczyk, Associate Professor
Jagiellonian University in Krakow, Poland

Professor Dr Arne Isaksen
University of Agder, Norway

Dr James Karlsen, Associate Professor
University of Agder, Norway

Interaction for innovation: comparing Norwegian regions

Marina Solesvik[1], Magnus Gulbrandsen[2]

Abstract

Building upon insights from earlier investigations of innovation collaboration from a regional perspective as well as the triple helix perspective, local/regional innovation systems and open innovation approaches, this study explores whether cooperation between firms, universities and government increases the intensity of innovation equally for the capital city and peripheral regions. We investigate whether firms located in the capital region benefit more from public support, cooperation with universities, and cooperation with different stakeholders than firms located in peripheral regions. Using logistic binary regressions, we find that capital region firms are generally not more innovative than those located elsewhere. We also find no effect on innovation from cooperation with universities, although public support is related to engagement in product and process innovations. Our results warn against simple applications of triple helix and open innovation approaches, as many forms of collaboration seem to have little impact on innovation, regardless of regional context.
Keywords: *innovation, cooperation; triple helix model; regional innovation systems; Norway.*

Introduction

The need for innovation has been highlighted by policymakers worldwide, believing that this is important for the competitiveness of firms and wider social and economic benefits for the regions where the firms are found. OECD has in particular highlighted the need to establish good framework conditions to ensure collaboration between firms and other actors at regional, national and international levels (e.g. OECD, 2008 on Norway). Innovation is a collective process which occurs in a system where geography, regional organization and proximity are important factors in order to understand successful innovation processes (Asheim and Gertler, 2005; Laursen et al. 2011; Laursen et al. 2012a and b; Herstad et al. 2014). Research and innovation policy at the

1   Marina Solesvik, Professor Dr, Stord/Haugesund University College, Bjørnsonsgate 45, 5528 Haugesund, Norway; Bergen University College, P.O. Box 7030, Nygårdsgaten 112, 5020 Bergen, Norway, mzs@hsh.no.
2   Magnus Gulbrandsen, Professor Dr, Center for Technology, Innovation and Culture (TIK), University of Oslo, Postbox 1108 Blindern, 0317 Oslo, Norway, tel.: +47 48 133 882, magnus.gulbrandsen@tik.uio.no.

regional level is complicated, especially in small open economies where the regional administrative level has limited political influence and resources. Complexity related to the number of industries, heterogeneity in firm size and other aspects are often almost equal at regional and national levels. At the same time, there are often significant R&D resources at the regional level and often several potentially strong industrial clusters, which makes it relevant to explore the impact of collaboration patterns and policy support at the regional level.

With the series of Community Innovation Survey (CIS) data emerging from many different European countries, much insight has been gained into the dilemmas confronting firms when it comes to innovation collaboration, openness and various forms of local and regional linkages and spillover effects. Still, the relationship between innovation results and collaboration are debated, and calls have been made for more studies of the various facets of this relationship (Laursen and Salter, 2006; Herstad et al., 2011). In this article, we study geographical patterns of innovation collaboration in city-regions in Norway, a small open economy in Northern Europe, and we will in particular focus on relationships between firms and universities and on the role of public support for innovation.

On a conceptual level, both the triple helix model (Etzkowitz and Leydesdorff 1997, 2000) and regional innovation system perspectives (Asheim and Coenen, 2005; Asheim and Gertler, 2005; Asheim, 2007) emphasize how economic and social development occur in close cooperation between governments, industries and universities. New organizations, norms and forms of cooperation emerge from cooperation between these three spheres of society, often within specific regions and cities. These perspectives are well suited as a backdrop to exploring cooperation between research environments, government support mechanisms, and industrial firms. The perspectives concentrate on heterogeneity and how regional governments can contribute to innovation by stimulating development of networks, clusters and cooperation.

Our investigation is a follow-up of earlier Norwegian empirical studies, especially ones looking at differences between regions/cities in the country (Strand and Leydesdorff, 2013; Herstad et al., 2014). We use CIS data to explore the following questions: (1) How does cooperation with different actors affect innovation in firms? (2) Are firms which cooperate with universities more likely to report differently on innovativeness than firms which do not cooperate with them? (3) Are firms which get public support more likely to report differently on innovativeness than those which do not get support?

The paper has several contributions. First, we add to the literature innovation interaction by further exploring university-industry-government

collaboration and its relationship to different types of innovation. Whereas the empirical literature on the triple helix model is limited, we further develop the concept of the triple helix to see whether cooperation between three helices is equally efficient for two different types of innovation (product and process). Second, we contribute to the literature on open innovation/collaboration by studying whether open innovation leads to more intensive innovation involvement, particularly for firms located in the capital region. We also add to the literature on regional innovation, and similar to Herstad et al. (2014), we find that firms located in the capital region are generally not more innovative than other firms, which may be a particular characteristic of Norway.

The paper is organized as follows: First, we discuss existing theoretical and empirical literature. From this we assume that participation of different actors in the firm's environment may assist a firm in accumulating innovation capability which increases its innovation intensity. Second, we discuss the sample and the methodology used to test the hypotheses. Information was gathered from a sample of the Norwegian firms which participated in the Community Innovation Survey (CIS) 2010 organized by Statistics Norway. Participation in CIS is compulsory in Norway. Third, we report the results from binary logistic analysis relating to links between cooperation patterns and innovation involvement. Fourth, we discuss our key findings and present suggestions for additional research. Implications for stakeholders involved are also discussed, along with some final conclusions.

Theoretical and empirical insights

Cooperation is related to innovation involvement (Afuah, 2000; Solesvik and Gulbrandsen, 2013), and a general finding from more than a decade of Community Innovation Surveys is the strong collaborative patterns of innovative firms. In the triple helix perspective, the role of universities is particularly highlighted, arguing that universities contribute significantly to innovation processes in different regions (Etzkowitz and Leydesdorff, 1997 and 2000). There are famous global success examples such as the Silicon Valley (Fritsch and Schwirten, 1999), Route 128 (Dorfman, 1988), Austin & San Antonio Corridor (Smilor et al., 1988), or the Cambridge region in the United Kingdom (Segal, 1988).

The general argument is that the high level of cooperation between actors in the region is crucial for the performance of the regional innovation systems. Universities are responsible for innovation, new technology and product development in one third of Training and Enterprise Councils in the UK (Huggins, 1998). The triple helix model highlights how university-

industry-government cooperation seems to lead to innovation in dynamic and heterogeneous linkages because universities are conceptualized as "knowledge hubs" which provide research, education of young people, and knowledge transfer (Mitra, 2012), often in their particular regions. Universities are "influential actors and equal partners in a triple helix of university-industry-government relations" (Etzkowitz, 2003: 295). They supply both qualified staff for firms and organizations and contribute to innovation development. Success of knowledge transfer from university to firms depends on the state of the economy (Mitra, 2012) and absorptive capacity of firms to take in new knowledge from the university (Clausen, 2013).

Universities are different; some are research-intensive, others are teaching-intensive. Research-intensive universities are important suppliers of fundamental and blue-sky knowledge, as well as applicable technologies for industry (Mitra, 2012). Thus, larger cities and their metropolitan areas benefit more from their universities in terms of innovation than smaller cities and towns having teaching-intensive universities in their regions (Gulbrandsen and Solesvik, 2012). The triple helix authors highlight an array of indicators used to measure effectiveness of university-industry-government relations, such as generation of social, human and intellectual capital (Mitra, 2012), and regional economic development (Etzkowitz, 2003). Empirical investigations from the UK show how patterns of collaboration between firms and universities are complex and based not just on geographical proximity (which only matters for some types of relations) but also on perceived quality of the university involved (Laursen et al., 2011). German investigations have questioned the strong emphasis on R&D collaboration, finding that this only weakly affects innovation and regional knowledge spillovers (Fritsch and Franke, 2004).

Studies investigating the influence of public support of R&D on innovation has been reviewed earlier (Productivity Commission, 2007). The majority of studies found positive effect of public support on the number of firms introducing innovation, on increased radical and incremental innovation (Hewitt-Dundas and Roper, 2010), enhancing firm's innovation activities (Almus and Czarnitzki, 2003), and improving market sector productivity (Haskel and Wallis, 2013). a brief comparative study (Johansen et al., 2013), however, found mixed results related to the Norwegian regions regarding the influence of the public support. In some regions, positive effect of the public support was observed, while in other regions, the effect of public support was not very significant and public innovation support programs have not promoted high-scale innovation development among the participating firms. This issue needs to be explored closer. This discussion leads us to suggest the following hypotheses:

Hypothesis 1:

There is a positive relationship between (a) public support of R&D, (b) firms' cooperation with universities and high intensity of product innovation.

Hypothesis 2:

There is a positive relationship between (a) public support of R&D, (b) firms' cooperation with universities and high intensity of process innovation.

What is referred to as "open innovation" (Chesbrough, 2003), i.e. a strong collaborative orientation in firms, is widely assumed to enhance innovation involvement, similar to the arguments of the triple helix perspective. Firms enhance their innovativeness by exploiting external knowledge which is disseminated through different actors (Tether, 2002) and available through various channels (Howells et al., 2003; Spithoven et al., 2010). Some advanced firms create favorable conditions for development of innovative ideas internally. Employees are considered as an important source of innovation and in some cases innovation circles are created. Job rotations and interdisciplinary teams inside the firm also serve to the dissemination knowledge, skills, and information inside the firm (Burton and Obel, 2004; Laursen, 2003).

Another source of innovative ideas are customers (Afuah, 2000), suppliers and competitors (Afuah, 2000; Ahuja, 2000; von Hippel, 1988), which are considered as not passive recipients of products but co-creators of innovative products. Even when customers, suppliers and competitors are not direct sources of innovation, they are still very important actors in information sharing (Afuah, 2000). New business models suggested that innovative firms rely more and more on various forms of external consultants related to innovation and even on competitors (Laursen and Salter, 2006).

It is argued that firms should be ready for open innovation, i.e. possess educated employees with absorptive capacity in order to understand and apply ideas proposed from outsiders and be ready to quickly commercialize viable ideas. Learning and collaboration orientation of the firm increases the benefits from open innovation (Reichwald and Piller, 2009). Organizational and cultural characteristics are important for implementing open innovation. Firms use significant amounts of time, money and other resources to find new innovative opportunities (Laursen and Salter, 2006). Finding open innovation partners is possible through networking. However, small firms owners and managers often have no time to participate in meetings in network organizations. Small firms also score relatively low in terms of absorptive capacity (Spithoven et al., 2010). Laursen and Salter (2006: 131) found that "those who search widely and deeply – tend to be more

innovative". However, several more methodologically rigorous studies have found a negative relationship between too much openness and innovation performance (Enkel et al., 2009; Laursen and Salter, 2004; Vahter et al., 2012). a Norwegian investigation found that there are different strategies of openness, concluding that firms should strive to maintain "organizational contexts" and build competences rather than blindly follow a general collaborative orientation (Ebersberger and Herstad, 2011). This discussion leads us to suggest the following hypotheses:

Hypothesis 3: There is a positive relationship between firm's cooperation with (a) clients, (b) suppliers, (c) competitors, (d) consultants and high intensity of product innovation.

Hypothesis 4: There is a positive relationship between firm's cooperation with (a) clients, (b) suppliers, (c) competitors, (d) consultants and high intensity of process innovation.

Hypothesis 5: There is a positive relationship between firm's use of (a) internal sources, (b) professional sources, and (c) university sources of information and high intensity of product innovation.

Hypothesis 6: There is a positive relationship between firm's use of (a) internal sources, (b) professional sources, and (c) university sources of information and high intensity of process innovation.

Several large-scale Italian investigations found that the level of social ties in a region strongly predicts the collaboration patterns and the benefits that firm derive from collaboration for innovation (Laursen et al., 2012a and b). This and other empirical studies highlight the heterogeneity of regions. In Denmark and several other countries firms located in the capital metropolitan area are considered as more innovative than firms in the peripheral regions (European Union, 2014). One possible explanation is that capital regions have strong research and development institutions. Lester (2005) suggests that R&D environments can be a creative meeting spot in the leading cities. However, several studies of Norwegian firms using different types of data have failed to find any significant difference between the Oslo metropolitan area and other Norwegian regions in terms of innovation activity in general (Herstad et al., 2011; Strand and Leydesdorff, 2013). Herstad et al. (2011) study was that they considered innovation activity of Norwegian firms in general, and an interesting follow-up is to see how different patterns of collaboration affect different types of innovation. Florida (2002) argues that

in this context highly educated, entrepreneurially oriented and innovative employees are important for growth and innovation. a well educated population, population which is heterogeneous with respect for individual differences and choices, and well developed infrastructure are typical aspects and competitive advantages of capital regions. On the other hand, capital regions are often larger than other regions, and that is why there will be many more organizations and actors leading to coordination challenges. The size of the region influences other aspects as well, for example, related to social capital (Putnam, 1993), i.e. what types of informal social ties exist across organizational and sectoral borders. It can be assumed that there more informal meeting arenas in the small regions or more heterogeneous forms of social capital. The Oslo and Akershus region scores lower in terms of cooperation than other regions in Herstad et al. (2011). On the other hand, a later Norwegian investigation of knowledge-intensive business services, found to be important facilitators in collaborative networks, highlights the central role of the capital region and the weak contexts found in many smaller city-regions (Herstad and Ebersberger, 2013).

Finally, it can be added that regional collaboration is not just related to local spillovers and effects. a recent Norwegian study argues that the innovation networks of firms are global, where local knowledge bases (Asheim and Coenen 2005) affect the participation of firms in what is referred to as "global innovation networks" (Herstad et al., 2014). We suggest the following hypotheses:

Hypothesis 7: The relationship between public support of R&D and intensity of innovation is moderated by regional context such that there is a different degree of influence of R&D public support on innovation development in different regions.

Hypothesis 8: The relationship between cooperation between firms and universities and intensity of innovation is moderated by the regional context such that there are different influences on cooperation between firms and universities on innovation development in different regions.

Research Method and Data

Sample, data collection and respondents

To test our hypotheses, we used primary information from the Community Innovation Survey collected by Statistics Norway. Data collection was undertaken with a questionnaire administrated in Norwegian. In Norway,

answering CIS survey is compulsory for firms with more than five employees; with a stratified sample of firms with less than 50 employees and the full population of firms with more than 50. Not answering the CIS survey will lead to penalties to enterprises and the response rate is more than 90 per cent. The European CIS survey is a cross-country study which uses the same questionnaire and administered semi-annually in the EU member countries. We used data from CIS2010 to answer the research questions of this study. All together 6595 valid answers were obtained in Norway. 1503 (22.8%) respondents from the total sample indicated that they innovated. The distribution of the sample by sectors is given in Table 1.

Table 1. Sectoral break down of sample (n=1503)

Sectors	Firms with innovation	Product innovation	Process innovation
Agriculture & fisheries	1.9%	81.8%	68.2%
Mining & quarrying	2.9%	74.1%	69.0%
Industry	45.4%	73.2%	70.3%
Electo & natural gas supply	1.8%	62.5%	50.0%
Water and drain	1.3%	60.0%	27.3%
Construction	2.1%	53.6%	28.8%
Car sale	5.9%	39.9%	43.8%
Transport & warehousing	1.7%	41.7%	20.7%
Hotels & catering	0.2%	5%	4.3%
ICT	19.9%	76.6%	71.7%
Finance	1.8%	34.1%	45.2%
Consulting and R&D services	14.1%	78.8%	68.9%
Business services	0.9%	50.0%	33.3%
Culture	0.2%	40.0%	66.7%
Total	100%	67.6%	61.1%

We have followed standard industrial classification SIC 2007 (SSB, 2014). We used only respondents who innovated to test our hypotheses. There were 468 respondents from the Oslo and Akershus region. There were 143 respondents from Bergen and Hordaland county, 151 respondents from Stavanger and Rogaland county; 105 respondents from Trondheim and Trondelag county, 45 respondents from Kristiansand and Agder county, 36 from Tromsø and Troms county, and 555 from the rest of the country. It is somewhat difficult to estimate correctly the location of the firm because firms might have offices in several regions and countries. This is methodological

limitation of the CIS. We estimate location according the data provided in the survey.

Sample Representation

The sample comprises only firms with 5 and more employees. The mean size was 161.97 (SD = 629.36).

Measures

Dependent Variables

Innovation developed and introduced by firms was measured using several variables. We measured innovation introduced in the functional areas: product and process innovation.

Product innovation. The respondents were presented with the following two statements to measure product innovation: Has the firm introduced products (goods or services) in the market which are new or significantly improved for the firm in 2008-2010, and has the firm introduced products in the market which are not just new or improved for the firm, but also for the firm's market in the period 2008-2010? With regard to each statement, firms which introduced new products were allocated a score of '1', and those not introduced new products assigned a score of '0'. We summated scores such that the maximum value for product innovation was 2. For the binary logistic analysis, we then allocated a value of '1' for summated scores 1 and 2, and value of '0' for scores of 0 (Product I).

Process innovation. The respondents were presented with the following three statements related to introduction of process innovation in 2008-2010: (a) new or significantly improved methods of production or processing of goods or services; (b) new or significantly improved methods of storage, delivery, or distribution of goods or services; and (c) new or significantly improved methods of support, such as systems of maintenance, purchase, accounting or IT. With regard to each statement, firms which introduced new products were allocated a score of '1', and those not introduced new processes assigned a score of '0'. We summated scores such that the maximum value for process innovation was 3. For the binary logistic analysis, we then allocated a value of '1' for summated scores 1, 2 and 3, and value of '0' for scores of 0 (Process I).

Independent Variables

Types of cooperation partners. We have checked for the cooperation with various actors, i.e. (1) cooperation with suppliers (C. suppl.); (2) cooperation with clients (C. clients); (3) cooperation with competitors (C. compet.); (4) cooperation with consultants (C. consult.); and (5) cooperation with universities (C. univers.).

Knowledge sources. Respondents were presented with the following statement related to the sources of knowledge: Please indicate the sources of knowledge or information used in your innovation activities, and their importance during the period 2008-2010. Following Mol and Birkinshaw (2009), we divided knowledge sources into three variables, i.e. internal sources, university sources, and professional sources. *Internal sources (Int. sources)* included sources (a) within the enterprise, (b) other enterprises within the enterprise group. *Professional sources (Prof. sources)* included (a) professional conferences, meetings, (b) trade associations, (c) fairs, exhibitions. *University sources (Univ. sources)* included sources of R&D information from universities and university colleges. For each type of knowledge sources, the value of '1' was allocated for firms that had used a knowledge source, the value of '0' was allocated for firms that had not used a particular knowledge source.

Public support. Governmental support is an important part of the triple helix model. The Norwegian national and regional authorities have introduced a number of funds and special programs aimed to support innovation development. Firms were allocated the value of '1' if they have used any of the following support funds (a) Norwegian Research Council; (b) Skattefunn (tax reduction scheme); (c) Innovation Norway; (d) ministry, directorate, regional government, local community or other similar source; and (e) EU finance (Support).

Control Variables

Firm size. Firm size might influence on the innovation behaviour of firms. The variable is calculated as the logarithm of the number of employees (Size).

Patents. Firms which have patented their products were allocated a score of '1', otherwise they were allocated a score of '0' (Patents).

Major regions. The study's aim is to compare innovation behaviour of firms in the capital region and five major regions of Norway around biggest cities, i.e. Bergen, Stavanger, Trondheim, Kristiansand and Tromsø areas. All these are university towns and with significant industry presence. We introduced six dummy variables for each region. Firms situated in the Oslo and the Akershus region around it were allocated the value of '1', otherwise

a value of '0' (Oslo). Firms situated in Bergen and Hordaland region around it were allocated the value of '1', otherwise a value of '0' (Bergen). Firms situated in Stavanger and Rogaland region around were allocated the value of '1', otherwise a value of '0' (Stavanger). Firms situated in Trondheim and Trondelag region around were allocated the value of '1', otherwise a value of '0' (Trondheim). Firms situated in Kristiansand and the surrounding Agder region were allocated the value of '1', other otherwise a value of '0' (Kristiansand). Firms situated in Tromsø and Troms region around were allocated a value of '1', otherwise a value of '0' (Tromso).

Results

Variables means, standard deviations, and correlations coefficients are reported in Table 2.

Binary logistic regression analysis was used to test our hypotheses. Table 3 shows the results of our analyses.

Model 1 is the model reporting main effects of control variables on product innovation. Those who had registered patents (Patents) were significantly more likely to report product innovation ($p < 0.001$). Those who have received public support from Innovation Norway, EU, Research Council of Norway, or local governments (Support) ($p < 0.05$) were significantly more likely to report a high intensity of product innovation. Hypothesis 1a is supported. Additionally, firm's size is negatively and significantly ($p < 0.001$) related to innovation, i.e. smaller firms are more innovative. Firms situated in Kristiansand region are significantly ($p < 0.05$) less innovative in terms of product innovation.

Model 2 is the model reporting main effects of independent variables on product innovation. Cooperation with universities is negatively and significantly ($p < 0.01$) related to product innovation. Hypothesis 1b is not supported. Cooperation with clients is positively and significantly ($p < 0.001$) related to product innovation. Hypothesis 3a is supported. Cooperation with suppliers, competitors and consultants is not significantly related to product innovation. Hypotheses 3b-d are rejected. Those who used professional sources of information reported significantly ($p < 0.05$) higher level of product innovation. Hypothesis 5b is supported. Use of internal and university sources is not significantly related to product innovation. Hypotheses 5a and 5c are rejected.

Table 2. Variable Means, Standard Deviations, and Correlation Coefficients (n = 1503)[a]

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Size (ln)	1.74	.52	1.00																		
2. Patents	.95	.23	.01	1.00																	
3. Support	.34	.47	-.15**	.00	1.00																
4. Oslo	.32	.47	.11	.02	-.01	1.00															
5. Bergen	.10	.29	-.02	-.04	-.02	-.22***	1.00														
6. Stavanger	.10	.30	.03	-.03	-.04	-.23***	-.11***	1.00													
7. Trondheim	.06	.24	-.06*	.00	.03	-.18***	-.08**	-.09**	1.00												
8. Kristians.	.03	.17	.02	-.01	-.01	-.12***	-.06*	-.06	-.05	1.00											
9. Tromsø	.02	.14	-.04	.02	.04	-.10***	-.05	-.05	-.04	-.02	1.00										
10. C. suppl.	.21	.41	.14**	.04	.13***	-.04	-.02	.01	.01	.01	.02	1.00									
11. C. clients	.23	.42	.10**	.05	.06*	-.04	-.04	.01	.01	-.01	.03	.52***	1.00								
12. C.compet.	.09	.29	.11**	.04	.04	.01	-.01	.01	-.02	-.01	.04	.43***	.46***	1.00							
13. C. consult	.15	.35	.09*	.03	.08*	.01	.01	-.01	-.02	.01	.06*	.47***	.48***	.47***	1.00						
14. C. univers.	.17	.38	.18***	.04	.12*	.01	-.03*	-.02	.05	.03	.03	.48**	.47***	.43***	.47***	1.00					
15. Int.sources	.95	.22	.04	.24**	.00	.01	-.02	.02	-.02	.01	-.01	.05	.05	.03	.03	.41***	1.00				
16. Prof.sources	.91	.29	.01	.19**	.02	-.01	.02	-.04	-.01	-.01	.02	.09*	.10*	.08**	.09**	.08**	.08**	1.00			
17. Univ.sources	.68	.46	.09*	.06*	.07	-.05	-.02	-.03	.03	-.01	.06	.17	.17***	.14***	.14***	.24***	.14***	.34***	1.00		
18. Product I.	.63	.49	-.08**	.05	.11***	.06	.03	-.04	-.01	-.06	-.01	.07*	.14***	.14***	.03	-.01	.14***	.11***	.03	1.00	
19. Process I.	.46	.50	.03	.05	.04	-.02	-.02	.02	-.01	-.02	-.01	.14***	.13***	.13***	.10***	.09***	.13***	.05*	.01	.08**	1.00

(a) * $p<0.05$ (two-tailed), ** $p<0.01$ (two-tailed).

Table 3. Results of the binary logistic analysis for predicting types of innovation (n = 1503)a

Dependent variable: mindset	Model 1: Product innovation	Model 2: Product innovation	Model 3: Process innovation	Model 4: Process innovation
Controls				
Size (log)	-.515*** (.099)	-.590*** (.111)	-.048 (.094)	-.168 (.104)
Patents	1.186*** (.121)	1.021*** (.141)	.473*** (.115)	.340* (.138)
Public support	.252* (.116)	.246* (.120)	.181*** (.108)	.116 (.111)
Oslo	.162 (.140)	.258 (.143)	-.164 (.128)	-.099 (.132)
Bergen	.134 (.207)	.269 (.213)	-.135 (.191)	-.052 (.196)
Stavanger	-.309 (.197)	-.256 (.202)	.021 (.186)	.047 (.190)
Trondheim	.207 (.242)	.319 (.246)	-.412 (.222)	-.376 (.227)
Kristiansand	-.717* (.327)	-.618 (.336)	-.137 (.317)	-.102 (.324)
Tromso	-.005 (.384)	-.029 (.390)	.042 (.329)	.083 (.360)
Independent				
Coop suppliers		.209 (.180)		.609*** (.158)
Coop clients		.915*** (.193)		.177 (.164)
Coop competitors		.060 (.232)		.262 (.204)
Coop consultants		-.275 (.190)		.079 (.168)
Coop universities		-0.553** (.190)		.012 (.163)
Internal sources		.016 (.302)		.108 (.294)
Proffes. sources		.576* (.232)		.130 (.270)
University sources		-.267 (.168)		-.144 (.150)
Constant	.629** (.199)	.401 (.213)	-.488* (.192)	-.566** (.208)
-2 log likelihood	1805.341	1758.113	2031.213	1981.326
% correctly classified	69.6	70.2	57.7	60.8

a) Standardized beta regression coefficients * p<0.05; ** p<0.01; *** p<0.0

Model 3 is the model reporting main effects of control variables on process innovation. Those who had registered patents (Patents) were significantly more likely to report process innovation (p< 0.001). Those with

public support (Public support) (p< 0.001) were significantly more likely to report a high intensity of process innovation. Hypothesis 2a is supported. Location of the firms was not significant for process innovation. Model 4 is the model reporting main effects of independent variables on process innovation. Cooperation with universities is not significantly (p< 0.01 related to process innovation. Hypothesis 2b is not supported. Cooperation with suppliers is positively and significantly (p< 0.001) related to process innovation. Hypothesis 4b is supported. Cooperation with clients, competitors and consultants is not significantly related to process innovation. Hypotheses 4a, 4c and 4d are rejected. Use of internal, professional and university sources is not significantly related to process innovation. Hypotheses 6a-6c are rejected.

Six interaction variables relating to moderating role of the region were included in the models (Support*Oslo, Support*Bergen, Support*Stavanger, Support*Trondheim, Support*Kristiansand, Support*Tromso). We run binary logistic regressions to test Hypothesis 7. None of these interaction terms was significant. We have not reported them in Table 3 in order to save space but the results are available from the authors. Hypothesis 7 is not supported.

Six interaction variables relating to moderating role of the region between cooperation with university and innovation development were included in the models (C. univers.*Oslo, C. univers.*Bergen, C. univers.*Stavanger, C. univers.*Trondheim, C. univers.*Kristiansand, C. univers.*Tromso). We run binary logistic regressions to test Hypothesis 8. None of these interaction terms was significant. We have not reported them in Table 3 in order to save space but the results are available from the authors. Hypothesis 8 is not supported.

Discussion

This study expands several earlier investigations of innovation collaboration from a city region perspective, several of which have explored related issues in Norway. Data was gathered from a sample of Norwegian firms with 5 and more employees (CIS 2010). The analysis has confirmed that both innovation and cooperation are multi-dimensional concepts, and specific dimensions of innovation and cooperation need to be considered on their own.

Results from the binary logistic regression analysis suggests that firms situated in the capital region of Norway do not score higher in product and process innovation. Studies have warned that firms in the Oslo region are not more innovative than firms in other regions of Norway (Herstad et al., 2011). Previous research considered innovation as a general concept. Our study has corroborated and also nuanced this finding. We have considered relations between collaboration partners, sources of information and two different types of innovation, i.e. product and process innovations.

We have in many ways empirically tested the triple helix model by looking at the relationship between firms, universities and public support. Interestingly, we detected that public support of innovation is effective for product and process innovation. These latter two types may depend more upon internal and market-related characteristics that are not well captured in the CIS survey. Additionally, we have not found support for the hypotheses that cooperation with universities is positively associated with any type of innovation in Norway.

Cooperation with suppliers was positively associated with process innovation, while cooperation with clients was positive for product innovation. Cooperation with consultants, competitors and universities was not positive for innovation at all. There may be underlying industry differences that we have not been able to control for, however.

Use of professional sources of information is still the most important for product innovation. Use of internal and university sources of innovation were not associated with any type of innovation, which in itself does not lend strong support neither for the triple helix perspective nor the model of open innovation. a clear message emerging from this study, and following a number of earlier investigations, is that openness and R&D collaboration are not general (positive) phenomena related to innovation, but most likely related to characteristics of firms such as absorptive capacity and competence profiles that are not easily read from the CIS data (cf. Fritsch and Franke, 2004; Ebersberger and Herstad, 2011).

The evidence suggests that innovation should not be regarded as a homogeneous phenomenon. There are clear differences in the influences on the various types of innovation, and future studies on regional innovation need to conceptualize and consider the particular issues related to each type of innovation. As such our study makes several contributions. First, we integrate insights from the triple helix perspective with views with regards to open innovation and regional/local innovation systems, yet emerging with a critical message about the general claims often derived from the first two perspectives. Second, we challenge the view that governmental support generates equal benefits for both all types of innovation. Two novel hypotheses relating to regional difference in use of governmental support and cooperation with universities and research institutions and firms are presented and tested for the first time. We hypothesized that there is a regional difference in use of support money and utilization of cooperation with universities. We have not found support for this hypothesis. However, we tested the influence of control and independent variables only on product and process innovation. Further research might explore the effect of different variables on organizational and market innovation.

Implications for Practitioners

Our results are of interest to policymakers at regional and national levels. Whereas government support may be central for the more technical types of innovation (process and product) and the early steps of creating new products. Our data leads us to question whether these policies will be effective. Similarly, there is a general tendency to support university-industry collaboration in many different innovation and R&D support mechanisms. a "one size fits all" open, networked or triple helix innovation perspectives in designing policies and strategies may not have the desired effects.

Implications for Research

Future research evidence is warranted here to guide collaboration decisions relating to the development of various types of innovation. This study has addressed several problems suggested by previous studies such as operationalization of innovation, the type of collaborations partners, and sources of information used to extract innovative ideas. Despite the key findings, our study is associated with limitations that provide opportunities for additional research attention. This study focused on cooperation with universities, commercial partners and governmental organizations in providing support for different types of innovations. The study did not consider whether collaboration benefits firms with less than 5 employees. We do not know how far smallest firms use governmental support and cooperate with others for development of innovative products. Previous research suggest that they should on one side actively use open innovation business models (Chesbrough, 2003). But on the other hand, the owners and managers of small firms are so busy that they do not have time and resources to participate in networking (Spithoven et al., 2010), and have limited absorptive capacity to 'digest' all innovative ideas which they meet (Laursen and Salter, 2006). Future research needs to address this issue in a longitudinal study. In particular, we recommend that later investigations look more closely at industry differences, an aspect difficult to scrutinize with the rather small samples from the different Norwegian regions.

Cross-sectional survey evidence was explored. Longitudinal studies focusing upon representative samples of small and large firms need to be provided. In line with previous studies (Fitjar and Rodriguez-Pose, 2013; Herstad et al., 2011), this study focused on regional difference in terms of innovation in the Norwegian context. Future studies need to monitor the income extracted from implementation of innovations, as well as a broad array of innovation outcome measures, and not solely the narrow measure relating to the implementation of different types of innovation. While

most innovation studies have been conducted in Western contexts, future studies should consider impact of cooperation and governmental support in emerging economy contexts as well.

This study was limited to firms with 5 and more employees in Norway. Our findings might, therefore, be only limited in their generalizability beyond this context. Additional research is warranted to explore the external validity of presented findings with regard to other countries and smaller firms. Countries differ in terms of size, level of economic development, R&D support, supply of natural resources, human resources, and other factors. Future studies could explore what specific types of innovation policy are most successful in encouraging firms to develop innovations.

Conclusion

We have sought to answer three research questions: How does cooperation with different actors affect innovation in firms? Are firms which cooperate with universities more likely to report differently on innovativeness than firms which do not cooperate with them?, and Are firms which get public support more likely to report differently on innovativeness than those which do not get support? In particular we have been interested in studying regional variation in Norway related to these questions. We have explored the role of cooperation with firms in the same enterprise group, suppliers, customers, competitors, and consultantsFor the first question, we found out that cooperation with clients is positively and significantly related to product innovation and cooperation with suppliers is positively and significantly related to process innovation. Other forms of cooperation has little effect, including universities which do not emerge as significant partners for innovation in our data (question two). Use of professional sources of information is the most important for product innovation. Other sources of information were not significant for innovation.

Finally, for the third question we explored whether public support is related to actual innovation results, which is assumed to be essential during the innovation process. We found that firms receiving public support for R&D report higher levels of product and process innovation. Additionally, novel two-way interactions relating to six main Norwegian regions and innovation support as well as cooperation with universities (i.e., links between cooperation with university and specific benefits potentially generated by geographical location) were explored. Our regional variables were not significant in any of the regressions.

Our results provide words of cautions to simple applications of triple helix and open innovation frameworks. Only some types of university-

industry-government interaction seem to be important and only for some types of innovation. We have not found evidence of a capital city effect, hypothesized as important due to the concentration of human capital and research and technology support systems, which may be due to particularities of the Norwegian innovation system. This is not necessarily because there is anything wrong with a collaborative approach to innovation. But the effects are likely to vary and to be more nuanced than what at least some of the interpretations of these approaches indicate. Many forms of collaboration seem to have little impact on innovation, regardless of regional context. This warrants additional research attention and further elaboration of triple helix and open innovation approaches. Future research can strengthen the generalizability of our findings by conducting cross-sectional and longitudinal evaluations of university-industry-government interaction in different national contexts and for more types than product and process innovations.

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Abstrakt (in Polish)

Na podstawie dotychczasowych badań nad współpracą w dziedzinie innowacji na poziomie regionu oraz w oparciu o teoretyczne koncepcje potrójnej helisy, lokalnych i regionalnych systemów innowacji i innowacji otwartej, w artykule bada się czy współpraca między firmami, uniwersytetami i władzami publicznymi w równym stopniu zwiększa innowacyjność przedsiębiorstw w stolicy Norwegii i w regionach peryferyjnych. Analizuje się ponadto, czy norweskie firmy zlokalizowane w regionie stołecznym w większym stopniu korzystają ze wsparcia publicznego, współpracy z uniwersytetami i z innymi interesariuszami, niż firmy zlokalizowane na peryferii. Na podstawie logistycznej regresji binarnej wykazano, że przedsiębiorstwa z regionu stołecznego nie są generalnie bardziej innowacyjne, niż firmy z innych lokalizacji. Ponadto, nie stwierdzono, aby współpraca z uniwersytatami wpływała na innowacyjność, jakkolwiek występuje zależność między korzystaniem ze wsparcia

publicznego i innowacyjnością w zakresie produktu i procesu. Wyniki badań sugerują, że należy unikać uproszczeń w stosowaniu koncepcji potrójnej helisy i innowacji otwartej, gdyż wiele form współpracy wydaje się mieć ograniczony wpływ na powstawanie innowacji, niezależnie od kontekstu regionalnego.
Słowa klucze: *innowacja, współpraca, potrójna helisa, regionalne systemy innowacji, Norwegia*

Biographical Notes

Marina Z. Solesvik is a professor of Innovation and Management at the Stord/Haugesund University College. She also holds part-time positions as professor at the University of Tromsø, University of Nordland and Bergen University College (Norway). She is also a board member at the several Norwegian firms and organizations. Marina holds a PhD in Management from the Graduate Business School at the University of Nordland and PhD in Entrepreneurship from the Institute of Agrarian Economy in Kiev, Ukraine. Her research interests include regional innovation, open innovation, maritime business, entrepreneurial intentions, female entrepreneurship, strategic alliances, and Arctic research.

Magnus Gulbrandsen is professor and leader of the Innovation group at the Center of Technology, Innovation and Culture (TIK) at the University of Oslo. His research topics have included the role of public research organizations in innovation, commercialization of research and university-industry relationships, the nature and legitimacy of research institutes, internationalization of R&D and innovation, quality in science, and the organization and funding of research work in different settings. He has an extensive publishing record and has also worked as a contract researcher and consultant.

Collaboration patterns and product innovation in the Basque Country. Does a firm's nationality matter?

Henar Alcalde Heras[1]

Abstract

More and more, the ability to innovate can be considered as an explanatory factor in determining the long-term potential of firms to be competitive. Therefore, it is of increasing importance to understand the critical success factors behind notably radical product innovations. The present paper explores the yields and results in terms of a series of competitiveness indicators that domestic and foreign firms in the Basque Country obtain from technological collaboration practices. In particular, the study seeks to assess differences in the way these two groups of firms organize their technological partnerships (in terms of the geographical spread of partners with whom they cooperate and the purposes for which they deploy collaboration: for commercial or science/knowledge generation), and the comparative differences that stem from their respective practices. The study uses firm level data from the Euskadi Innovation Survey 2011, for firms located in the Basque Country. The paper finds that (a) technological collaborations comprising different types of partners have the greatest positive impact on innovation novelty, and (b) when looking at the firm's nationality, collaboration strategies developed by foreign firms have a higher impact on achieving novel innovation. We posit that the higher degree of product innovation we observe among foreign firms – as opposed to domestic firms in the Basque Country – relies on their ability to benefit from both inter-regional partnerships and commercial-based networks for the sake of innovation purposes.
Keywords: collaboration, product novelty, ownership nationality, innovation

Introduction

This research explores the yields and competitiveness that domestic-owned and foreign-owned firms located in the Basque Country obtain from collaboration practices. Specifically, this research tries to determine whether a firm's nationality (foreign versus local knowledge base) moderates the

1   Henar Alcalde Heras, Dr, Researcher, Orkestra-Basque Institute of Competitiveness and Deusto Business School C/ Mundaiz, 50 20012, Donostia-San Sebastián Spain, tel: +34 943 297 327, fax: +34 943 279 323, henar.alcalde@orkestra.deusto.es.

impact of technological collaboration agreements on that firm's ability to bring novel products.

Literature has largely shown that collaboration is a good method of improving firms' innovation capabilities. When relevant resources are not available in the organization itself, technological collaboration offers a good solution for product innovations. As long as innovation complexity increases, firms' ability to identify and absorb relevant knowledge will support the development of new products. (Becker and Dietz, 2004; Belderbos, Carree, Diederen, Lokshin and Veugelers, 2004; Nieto and Santamaria, 2007).

The rationale behind the research follows on from an analysis of innovation and competitiveness indicators with regard to domestic-owned companies from the Basque Country (CAPV). These companies can be considered highly competitive according to their levels of innovative performance in the national market. However, their position is far below average when comparisons are made with foreign-owned companies located inside the CAPV. For example, in 2010 the percentage of domestic-owned firms that introduced a novel product in the market was 8.8%, while the average was 20.89% for foreign-owned firms located inside the CAPV. However, when we look at firms engaged in technological collaboration we find that 45.71% of domestic-owned companies has developed technological collaboration; this figure is very similar to the 42.3% of foreign-owned firms (located inside the CAPV) engaged in technological partnerships.

Therefore, previous figures suggest that domestic-owned firms in the Basque Country do not perform efficient innovation practices, and their under-performance can be a consequence of unsuitable collaboration practices. In order to build a competitive innovation strategy, this research will explore what would be suitable collaboration patterns for firms located in the CAPV to achieve novel product innovations. Specifically, as explained in Figure 1, we assess whether the nature of the knowledge base (defined by a firm's nationality) moderates the impact of technological collaboration agreements on the degree of product newness. We focus on product characteristics to determine whether an innovation can be considered radical or incremental. Radical innovations describe innovations with a higher degree of novelty, new or significantly improved products that involve a novelty for the market in which the firm operates. On the other hand, incremental innovations describe incremental product innovations without modifications or with slight modifications.

The paper proceeds as follows. The next section discusses different collaboration patterns, and sets out the hypotheses. Section 3 discusses the methodology and data; Section 4 presents the results; and the final section presents the conclusions.

Figure 1. Model specification for hypotheses development
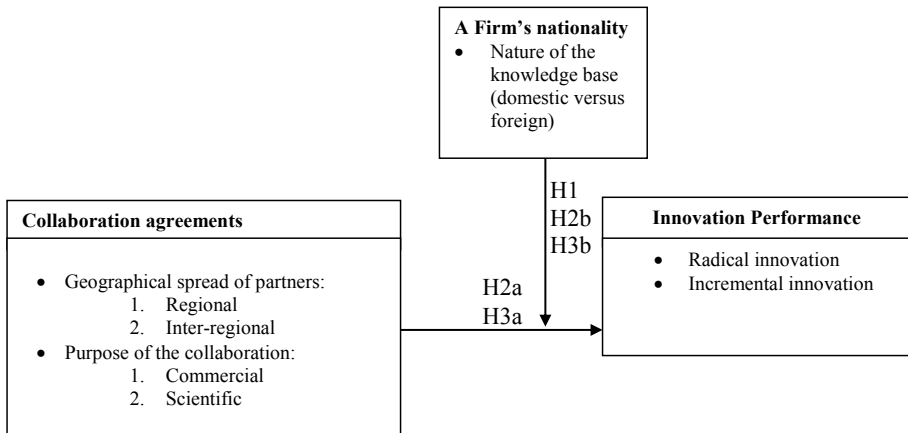
Theorizing collaboration patterns

Traditional literature has been largely concerned about external knowledge and innovation, devoting particular attention to performance issues. In today's knowledge-based economy, the ability to innovate is more important than cost efficiency in determining firms' sustainable performance. The ability of the firm to benefit from innovations in such environments quickly erodes and firms must obtain relevant knowledge in order to develop efficient innovations. Consequently, companies must balance their capacity to develop know-how with their ability to introduce novel products.

Innovations occur as a result of interactions between various actors rather than as a result of a solitary genius (Von Hippel, 1988); therefore, we must explore how collaboration mediates on it.

Traditional literature initially examined how markets for technology would enact innovation performance (Caves, Crookell and Killing, 1983; Hennart, 1988; Williamson, 1989; Mitchell and Singh, 1992; Hagedoorn, 1993). However, more recent studies have been focused on the effect of different innovative collaboration strategies in technological evolution (Rosenkopf and Nerkar, 2001), and the implications of an innovation search strategy on the final product introduction (Ahuja, 2000; Chesbrough, 2003; Laursen and Salter, 2006; Alcalde 2014). Another stream of research focuses on the motivation behind the type of collaboration and its impact on innovation performance (Miotti and Sachwald, 2003; Becker and Dietz, 2004); Belderbos et al., 2004; Nieto and Santamaría, 2007; Tsai and Wang, 2009).

However, the willingness to engage in collaborative agreements is conditioned by the internal organizational ability to explore the external

environment. Thus, the knowledge base of the company defined by a firm's nationality will be crucial to understanding the firm's strategic behaviour and innovative performance in international markets. Previous literature is equivocal about the innovativeness efficiency of domestic versus foreign companies.

Researchers conclude that the final impact of external knowledge acquisition on performance depends on many elements: theoretical assumptions; context; specifics of knowledge and its sources; type of innovation; and type of performance variable analyzed (Frenz and Ietto-Gillies, 2009).

On one hand, one literature stream argues that foreign firms face home country knowledge restrictions; therefore, these companies suffer a pervasive dependency on home country sources as a main driver of innovation. Research posits that foreign firms provide important vehicles for transferring research and knowledge within MNE units while external collaboration can lead to a depreciation of internal capabilities and coordination costs (Weigelt and Sarkar, 2009).

Another literature stream considers external knowledge as a means to foster innovation by getting access to specialized resources and learning opportunities from the host country. More specifically, external knowledge flows have a positive impact on firm performance both through their direct effect on innovation by the subsidiary and, indirectly, through stimulating knowledge flows between the subsidiaries and other units within the MNE (Yasmin and Otto, 2004).

In the same way, research shows evidence that foreign firms use host knowledge to a greater extent than similar domestic firms (Almeida, 1996) and are most likely to result in innovation (Almeida and Phene, 2004, 2008).

These debates on the development of efficient collaborative agreements, a firm's nationality and innovative performance supports this paper to explore how foreign-domestic firms differ in product innovation novelty through technological collaboration practices in the Basque Country. To accomplish this research question, we addressed the following issues: the differentiation of technological collaboration strategies according to both the knowledge-based dimension and geographical location, and the empirical assessment of such collaboration strategies on different degrees of product innovation novelty (incremental and radical innovation).

Hypotheses

As pointed out before, companies must create new knowledge and renew their technological competences in order to be innovative. a firm's innovation

strategy involves a complex decision: whether to rely on internal R&D sources, external R&D sources, or apply both of them.

On the one hand, reliance on internal R&D has time and cost advantages, but over-reliance can lead to organizational rigidities and competency traps (Leonard-Barton, 1992).

On the other hand, external knowledge sourcing allows firms to explore new windows for opportunity, enlarge the innovation scope and more flexibility to face market uncertainty. Companies that achieve this flexibility are able to cope better with the speed, cost and complexity of technological development (Vanhaverbeke, Duysters, and Noordhoven, 2002; Tsai and Wang, 2009) and improve the organizational performance (Grant, 1996; Zahra and Nielson, 2002).

In the attempt to build a competitive innovation pattern, firms evaluate different partnership combinations, according to innovative purposes and firms' internal ability to profit from external linkages.

The goal of this study is to understand the rationale behind a competitive innovation pattern for companies located in the CAPV. In order to fulfill this objective from a reliable perspective, the study accounts for different technological collaboration dimensions: the geographical spread of partners with whom they cooperate (geographical location), and the purposes for which they deploy technological collaboration (knowledge-based dimension).

As long as the geographical location of partners shapes the content, the scope of the cooperative agreement and external knowledge should be analyzed according to the geography of collaboration in order to understand its effectiveness in innovation output. Specifically, this study distinguishes between different geographical levels, and regional and inter-regional technological collaborations. On the other side, external sources involve linkages with different organizations such as: corporate groups, customers, suppliers, competitors, consultants, technological centers, laboratories, universities and government agencies. Thus, this organizational heterogeneity must be analyzed carefully to understand its implications in the innovation output, making it essential to analyzing the purpose for which they deploy technological collaboration. This study follows (Yamin and Otto 2004) and distinguishes between business and non-business linkages. Specifically, this study differentiates between science-based and commercial-based technological collaborations. While commercial-based partners are located across the value chain and expected to be more directly related to problem-solving, science-based linkages may be more exploratory in nature. Thus, the impact of science system collaboration may help firms to redirect their efforts towards innovation sources. However, commercial-based agents would help firms to exploit their current knowledge patterns and search for new product solutions.

Foreign-domestic firms collaboration and product innovation

In order to determine how domestic firms could increase their innovation competitiveness in the market, this study explores if a firm's nationality moderates its ability to exploit collaboration agreements and its impact on product innovation.

As pointed out in the literature, technological collaboration practices are an important source of competitive advantage. Access to external relevant sources allows organizations to obtain relevant knowledge which cannot be produced inside the organization. Collaboration networks would support the innovation activities of collaboration partners, increasing the ability to introduce new products (Nieto and Santamaria, 2007; Becker and Dietz, 2004). Firms will consider external partners as sources of valuable knowledge, which cannot be produced internally, maximizing firm value through partners' resources combination and complementarities exploitation (Kogut, 1988).

However, the success of collaboration is conditioned by internal organizational characteristics and the willingness to engage in different collaborative agreements. In this sense, the latent nature of firms' knowledge base defined by nationality will be crucial to understanding their collaboration path and product innovation.

The starting point of this research analyzes if a firm's nationality moderates the impact of technological collaboration agreements on product innovation novelty.

The Basque Country is an example of sustainable regional development (Orkestra, 2008; OECD, 2011) and is the result of an effective cluster policy. The knowledge base in cluster emerges on the basis of technological complementarities (Porter 2003), claiming that specialization of related industries is beneficial for regional development (Boschma, Minondo and Navarro, 2010). This knowledge is supported by the dynamic flow of industry-related information, and the involvement of local culture with specific norms values and institutions (Malmberg and Maskell, 2002). This particular specialization from the knowledge base affects what is done within and among the firms and therefore what is learnt, how things are done and consequently how learning takes place (Lundvall and Maskell, 2000). According to previous assumptions, cluster industries would support an intensive collaboration among firms to benefit from specialized local synergies (Maskell, 2001); this restrictive collaboration will constrain the benefits from a broader collaboration strategy.

On the other hand, foreign firms own an international knowledge base from international market and heterogeneous partners. The subsidiaries of multinational corporations (MNC) have the potential to develop their knowledge base from two distinct knowledge contexts. As Almeida and

Phene (2004) posited: "First, subsidiaries are, a part of a MNC that has the capacity to share knowledge across its various units (Bartlett and Ghoshal, 1989). Second, subsidiaries are located in host country regions that often embody social, professional, and technological relationships among firms permitting inter-firm knowledge flows". The ability to develop technological agreements through these two different contexts would have a positive effect in innovation achievement (Andersson and Forsgren, 2000).

From literature sources, it is well known that innovation opportunities exist because of information asymmetry, and that firms that have access to a larger variety of sources of information are in a better position to identify and develop innovation opportunities and introduce products with a higher degree of novelty (Venkataraman, 1997; Amara and Landry, 2005). Due to foreign-owned firms benefitting from subsidized and more diverse networks, they would overcome over-specialization strategies supported by Basque region clusters. It seems reasonable to hypothesize that technological collaboration strategies developed by foreign firms have a higher impact on achieving novel innovation than the collaboration of domestic firms.

H1: "Among firms competing in the CAPV, the collaboration of foreign firms has a higher positive impact on novel product innovations than the collaboration of domestic firms"

Foreign-domestic firms' geographical collaboration and product innovation

In this section, we explore how a firm's nationality moderates the impact of different types of geographical technological collaboration on product innovation novelty. Specifically we want to answer:

1) Which type of geographical partnerships have a positive impact on novel product innovation
2) In which type of geographical partnerships do foreign-owned firms achieve superior innovation performance than domestic-owned companies.

In this sense, it would be interesting to analyze if the geographical dimension of the network would dictate firms' innovation competitiveness. In this sense we distinguish between three different types of collaborations patterns: regional (within CAPV), inter-regional (outside CAPV) and diverse geographic networks (regional and inter-regional partnerships).

As long as the geographical location of the partner just focuses on the geographical location (and does not distinguish between the knowledge content of the partnership), regarding the inter-regional we could posit the

following arguments according to the spatial collaboration typology and product innovation novelty.

First, firms located in the CAPV are involved in a localized cluster, where their knowledge base is based on specialization from related regional industries. If firms decided to support regional networks involving short distances across collaborators they would benefit from knowledge externalities: bringing people together, favoring information contacts and facilitating the exchange of tacit knowledge and innovation performance (Jaffe, Trajtenberg, Henderson, 1993; Audretsch and Feldman, 1996; Boschma, 2005). However, over-reliance on closer partners would lead to a spatial lock-in. When regions become too inward looking, the learning ability of local actors may be weakened to such an extent that they lose their innovation capacity and cannot respond to new environments (Boschma, 2005).

On the other hand, inter-regional networks would imply the access to collaborators outside the CAPV and enrich their knowledge base. This collaboration would allow firms to avoid a spatial lock-in risk and encourage interactive learning. Nevertheless, an exclusive reliance on inter-regional networks will make firms loose cluster advantages from closer interactions and tacit knowledge. Firms' distance from current knowledge sources would have a negative impact on innovation performance (Jaffe et al. 1993). Therefore, inter-regional collaboration would have a positive impact on product innovation if firms had the capabilities to integrate external knowledge and share the same values and expectations with inter-regional partners.

Finally, firms located in the CAPV which develop both regional and inter-regional networks will have a greater positive impact on the degree of product innovations than collaboration with only one type. An exclusive regional competitive pattern leads to an emphasis on the potential advantages of close and familiar cooperative exchange and encourages an excessive knowledge specialization. Thus, supporting excessive regional external sources will allow for the emergence of "lock-in" risk that deters firms' ability to develop product innovation. However, a combination between regional and inter-regional networks will allow firms to overcome experiential learning disadvantages from unfamiliar markets and cultural barriers. Looking at a firm's nationality we can posit that diversity in geographical collaboration would benefit all firms located in the CAPV. Foreign firms would reinforce their innovation position (through both host country networks and inter-regional opportunities), and it would allow domestic firms to support new diversification patterns, profiting from inter-regional partners.

H2a: "Among firms competing in the CAPV, diversity in geographical collaboration will have a more significant impact on product innovation novelty than collaboration with only one type of geographical partner"

According to the second question related to foreign firms' advantage in geographical collaboration, we posit the following reasoning.

If we look at the different geographical partnership patterns, it seems reasonable that exclusive dependence on regional networks by foreign firms will be harmful for the MNC knowledge base. More specifically, MNC's advantages due to experiential learning advantage and knowledge specificity would be lost due to exclusive reliance on regional partnerships that would involve subsidiary autonomy, which does not match with headquarter dependency. In the same way, we cannot assume the superiority of foreign firms in exploiting diverse geographical collaboration. Thus, while this diversity would benefit foreign firms in the reinforcement of their innovation position (through both host country networks and inter-regional opportunities), domestic firms would overcome lock-in risk, profiting from inter-regional and local partners.

So, the advantage for foreign firms in product innovation according to geographical collaboration would emerge from exclusive inter-regional technological collaborations. Foreign firms have easier access to these partnerships than domestic ones due to the nature of their knowledge base. More specifically, they have greater abilities to profit from inter-regional collaborations because they already benefit from current international knowledge sources, and openness culture (Ebersberger and Herstad, 2011). This knowledge orientation provides international platforms for collaboration in the form of subsidiaries abroad (Phene and Almeida, 2008) and learning advantages by identifying place-specific opportunities and partners with whom tight interaction is required (Lowe and Wrigley, 2010). On the other hand, firms in localized clusters stress informal networks and face-to-face contact to facilitate the exchange of specialized knowledge.

It can be concluded that foreign firms would benefit from easier access to international networks and experiential learning advantages to exploit inter-regional knowledge. However, domestic firms rely on relationships based on closer contact, and find it difficult to overcome experiential learning disadvantages in inter-regional contexts.

H2b: "Among firms competing in the CAPV, the inter-regional collaboration of foreign firms has a higher positive impact on novel product innovations than the inter-regional collaboration of domestic firms"

Foreign-domestic firms' knowledge-based collaboration and product innovation

In this section, we explore the role of different types of knowledge-based technological collaboration and the effect on innovation output. Specifically, we want to answer:

1) Which type of knowledge-based partnerships have a positive impact on novel product innovation
2) In which type of knowledge-based partnerships do foreign firms achieve superior innovation performance than domestic companies.

In this hypothesis there is an analysis of whether the knowledge orientation of the collaboration differs in product novelty. We distinguish between three different types of collaborations: science-based, commercial-based and diverse knowledge-based partnerships (scientific and commercial).

Science-based partners involve research organizations that encourage collaboration based on the first stage of generic knowledge (Belderbos, Carree, Diederen, Lokshin, Veugelers, 2004), providing new scientific and technological knowledge rather than exploiting innovation investments in the short-term and final product innovation. (Lundvall,1992; Drejer and Jørgensen, 2005). An exclusive reliance on scientific collaboration would be contrary to the assumptions involved in cluster industries, which support specialized industrial knowledge bases (Malmberg and Maskell, 2002). More specifically, an over-reliance on scientific collaborations would prevent these firms benefitting from interactive learning, which requires people sharing the same knowledge base and expertise to learn from each other (Boschma, 2005). In other words, a unique reliance on scientific partnerships involves too much distance across collaborators' knowledge bases, leading to difficulties in knowledge absorption and exploitation (Cohen and Levinthal, 1990). Therefore, we can conclude that a lack of complementarities in knowledge sources would be detrimental to the development of a novel product innovation.

Commercial partnerships involve collaboration among different collaborators in the industrial value chain. These technological collaborations will look for a fast return on their investment in order to obtain product commercialization benefits and involve knowledge that often is tacit and context-specific. Thus, an exclusive technological collaboration with commercial partners would be detrimental to learning and innovation due to a lock-in risk. Innovation requires complementary but dissimilar bodies of knowledge; thus homogeneous collaborations of specific knowledge would lead to competency traps, and a lack of novel sources (Boschma, 2005). Therefore, firms will suffer from myopia by restricting their innovation output to current technological combinations and deterring further innovation.

According to the previous argument, the unique reliance on commercial collaboration would make firms focus on incremental rather than novel innovation.

Nevertheless, Maskell (2001) posits that commercial collaborations can fulfill requirements for effective product innovation in firms in geographical clusters if it involves dissimilar and complementary knowledge leading to sustainable specialization, where the knowledge bases of the firms diverge to such an extent that interactive learning is stimulated.

However, a commercial partnership focused on specific and similar knowledge would be detrimental to innovation novelty. From this premise we cannot hypothesize either a positive or negative impact on novel product introduction; the final effect would depend on a firm's ability to encourage collaborations based on either dissimilar or traditional similar knowledge.

On the other side, diverse collaboration involves a great benefit for firms located in the CAPV, supporting new innovation patterns and encouraging novel product innovations. Diversity in technological collaborations would allow firms to benefit from scientific generic knowledge that is useful for developing new diversification patterns and avoiding lock-in risk. In the same way, commercial collaboration would allow firms to exploit their current knowledge base with different actors in the commercial value chain and the advantages of a cluster industrial network. Therefore, we can conclude that the variety of partners will have a greater positive impact on the degree of product innovation novelty than collaboration with only one type of partner (Nieto and Santamaría, 2007).

H3a: "Among firms competing in the CAPV, diversity in knowledge-based collaboration will have a more significant impact on product innovation novelty than collaboration with only one type of knowledge-based partner"

According to the second question related to foreign firms' advantage in these types of collaboration, we posit the following reasoning.

As long as both domestic and foreign firms located in the CAPV rely on specific and tacit knowledge, exclusive reliance on scientific collaboration would have a negative impact on novel product innovation. In the same manner, diversity in knowledge-based collaboration will benefit both domestic and foreign firms, allowing them to benefit from generic knowledge exploration (scientific collaboration) and specific knowledge exploitation (commercial collaboration).

However, we can expect a different impact of commercial collaboration on innovation output according to firms' nationality. As posited above, foreign firms benefit from performing in two different contexts. Thus, foreign

firms can benefit from commercial collaborations within the corporation but also from external partners. First, headquarters encourage the transference of knowledge across affiliates through an asset exploiting strategy. Second, foreign affiliates can support an asset-seeking strategy, augmenting existing assets by absorbing and acquiring technological spillovers from specific collaborators in the host-country. Therefore, pressure from headquarters to exploit R&D investments and firms' ability to access complementary and dissimilar knowledge would encourage firms to develop novel product innovations.

H3b: "Among firms competing in the CAPV, the commercial collaboration of foreign firms has a higher positive impact on novel product innovations than commercial collaboration of domestic firms"

Data and methodology

Eustat Innovation Survey
The analysis uses firm level data from the Euskadi Innovation Survey, collected by Eustat (the Basque Institute of Statistics) in 2010 and sampled to be representative at the regional level (Eurostat, 2006). The data is generated by a self administered survey questionnaire based on the homogenized and thoroughly tested European Community Innovation Survey (CIS). CIS data is used for generating official innovation statistics on the EU and its member countries and has been used extensively for analysis in economics (Cassiman and Veugelers, 2002; Cefis and Marsili, 2006; Czarnitzki, 2005), in management studies (Laursen and Salter, 2004, 2006; Frenz and Ietto-Gillies, 2009; Schmiedeberg, 2008; Grimpe and Kaiser, 2010), and in economic geography (Simmie, 2003, 2004; Ebersberger and Herstad, 2011).

The total data set contains 4,220 firms, but the empirical analysis is restricted to 1,290 firms that report information about technological collaboration agreements during the three-year reference period 2008-2010. We include innovating and non-innovating to avoid biased results (Tether, 2002; Cassiman and Veugelers, 2002).

3.1 Methodology

Variables

*Dependent variables
a) Radical Innovations: describes innovations with a higher degree of novelty. It takes the value 1 when the firm declares that some percentage of total turnover in 2010 comes from new or significantly improved products that were new to the market; otherwise its value is 0.
b) Incremental Innovations: describes innovations with lower degree of novelty. It takes the value 1 when the firm declares that some percentage of total turnover in 2010 comes from new or significantly improved products that were only new to the firm; otherwise its value is 0.

*Independent variables:
a) Collaboration (COLLABORATION). Firms indicated whether or not they had engaged in technological collaboration agreements during the period 2008-2010. COLLABORATION
b) Nationality. We create a dummy variable (FOREIGN) indicating if the firm has a foreign company as owner (≥50% of the total stock). It takes the value of 1 if the company is owned by foreign firm; otherwise its value is 0.
c) Type of technological collaborations: geographical collaborations and knowledge-based collaborations signed during the period 2008-2010. We create six dichotomous variables to measure the effect of different types of technological partnerships. According to the localization of the collaboration we distinguish between:
1) Regional collaboration exclusively (REG). The firm only collaborates with local partners during the period 2008-2010.
2) Inter-regional collaboration exclusively (INTERREG). The firm only collaborates with partners outside the region during the period 2008-2010.
3) Diverse-geographical collaboration (DIVERSEREG). The firm collaborates with both regional and inter-regional partners during the period 2008-2010. According to the knowledge-based character of the collaboration we distinguish between:
4) Science collaboration exclusively (SCIENCE). The firm only collaborates with science-based partners during the period 2008-2010. Science collaboration includes: universities, technological centers, R&D laboratories, and government organizations (Yamin and Otto, 2004)
5) Commercial collaboration exclusively (COMMERCIAL). The firm only collaborates with commercial-based partners during the period 2008-

2010 (Commercial collaboration includes: affiliates and subsidiaries, customers, suppliers, competitors, and consultancy firms.

6) Multi-knowledge collaboration (DIVERSEKNOW). The firm collaborates with both science and commercial partners during the period 2008-2010.

These mutually exclusive variables avoid potential problems of multicollinearity and capture the impact of each partner more clearly by separating it from the effects attributable to other partner types in heterogeneous networks (Nieto and Santamaría, 2007).

* Control Variables.

We realize that the levels of innovation in firms will depend on internal and external environmental factors regardless of collaborative agreements; therefore, we include different control variables for firm specific and industry characteristics.

According to firm specific characteristics we control for the size of the company, export intensity, group affiliation, R&D internal intensity, knowledge protection. Firstly, several studies find that the differences between domestic and foreign firms are mainly due to the different firms' group size (Falk, 2008); therefore, we control for the logarithm of company turnover (NETSALES). EXPSHARE measures the international orientation of the firm by its export share. Company group, irrespective of the location of company subsidiaries, is positively associated with innovation performance, we use a binary variable (GROUP) coded 1 if an enterprise is part of a company, and coded 0 if it is a single-unit firm. We include an indicator for internal R&D intensity, measured as the ratio of internal R&D expenses to the firm's total turnover (R&DEXP.). An indicator for formal IPR protection is introduced because protection enables the firm to protect proprietary knowledge during collaborative work and R&D contracting (PROPAT) (Ebersberger and Herstad, 2011).

We control for industry characteristics by the introduction of 43 industry dummy variables, albeit their coefficients are omitted from our tables (INDUSTRYDUMMIES).

The Model

As both dependent variables (Radical and Incremental) are dichotomous, estimation models such as logit or probit (Greene, 2000) would normally be appropriate. However, as the error terms of the two models are likely to be correlated, an extension of probit known as bivariate probit (Greene, 2000) is usually a more appropriate estimator. The bivariate probit model has the following specification:

$Z_{i1} = \beta'_1 X_{i1} + \varepsilon_{i1}$; if $\gamma_{i1} = 1$ if $Z_{i1} > 0$, $\gamma_{i1} = 0$ if $Z_{i1} \leq 0$,

$Z_{i2} = \beta'_2 X_{i2} + \varepsilon_{i2}$; if $\gamma_{i1} = 1$ if $Z_{i1} > 0$, $\gamma_{i2} = 0$ if $Z_{i2} \leq 0$,

$(\varepsilon_{i1}, \varepsilon_{i2}) \approx N (0, 0, 1, 1, \rho)$

The bivariate probit model was estimated using the Stata 11 routine, based on the method of simulated maximum likelihood. The difference between the specifications of each model lies in the explanatory variables (collaboration, and type of network).

Results

Table 1 below gives descriptive statistics, collinearity statistics, and correlations of all variables.

Table2 presents the regression results testing our first hypotheses. The ρ parameter is highly significant, this supports the choice of biprobit instead of the probit model. The Wald test also points out high significance of both variables for the models.

Table 2. Collaboration impact on product innovation

	Model 1a		Model 1b	
	RADICAL	INCREMENTAL	RADICAL	INCREMENTAL
COLLABORATION	0.613***	-0.225*	0.534***	-0.247*
FOREIGN	0.516**	-0.008	0.186	-0.134
COLLABORATION*FOREIGN			0.802**	0.321
GROUP	-0.147	-0.019	-0.164	-0.024
R&DEXP	-0.056	0.009	-0.056	0.009
PROPAT	0.755***	-0.194	0.762***	-0.199
EXPSHARE	0.379*	-0.613*	0.418*	-0.599**
NETSALES	0.013	0.074*	0.013	0.073**
INDUSTRY DUMMIES	Significant			
LR rho=0	39.974		40.448	
Wald test of full Model	303.98		305.35	
Log pseudolikelihood	-913.985		-910.21	
Number of observations	1290		1290	
One-tailed *t*-test applied.	***p > .01 **p > .05 *p > .10			

Table 1. Descriptive statistics

Variable	Mean	Std. Dev.	RADICAL	INCRE-MENTAL	SCIENCE	COM-MERCIAL	DIVER-SEKNOW	REG	INTER-REG	DIVERSE-REG	FOREIGN	GROUP	R&DEXP	PROPAT
RADICAL	0.095	0.294	1											
INCREMENTAL	0.962	0.192	-0.303	1										
SCIENCE	0.050	0.219	0.074	-0.034	1									
COMMERCIAL	0.052	0.222	0.038	-0.031	-0.054	1								
DIVERSEKNOW	0.203	0.402	0.264	-0.072	0.456	-0.118	1							
REG	0.103	0.304	0.011	-0.029	0.202	0.277	0.190	1						
INTER-REG	0.023	0.151	0.126	-0.012	-0.012	0.358	0.037	-0.052	1					
DIVERSEREG	0.180	0.384	0.214	-0.064	0.261	0.063	0.747	-0.159	-0.072	1				
FOREIGN	0.055	0.228	0.093	-0.002	0.089	0.045	0.072	-0.014	0.259	-0.003	1			
GROUP	0.712	0.453	-0.142	0.056	-0.058	-0.145	-0.198	-0.083	-0.132	-0.189	-0.347	1		
R&DEXP	0.183	3.795	0.010	-0.029	0.010	-0.016	0.029	-0.007	-0.012	0.039	-0.011	0.020	1	
PROPAT	0.062	0.241	0.406	-0.155	0.074	-0.045	0.211	-0.037	0.017	0.226	0.028	-0.084	0.026	1
EXPSHARE	0.064	0.180	0.162	-0.091	0.112	0.042	0.072	0.063	0.030	0.062	0.166	-0.190	-0.008	0.213
NETSALES	14.110	2.242	0.197	-0.069	0.081	0.135	0.246	0.070	0.134	0.258	0.218	-0.432	-0.057	0.162

In Model 1a we test the impact of collaboration on the development of novel products. As expected, the collaboration effect is positive and significant in firms' ability to develop radical product innovations; however, collaboration has a negative and significant impact on incremental innovations. The effect of a foreign nationality is highly significant in radical innovations; however, this foreign nationality takes a negative but insignificant effect on the development of incremental innovations.

In Model 1b we test Hypotheses 1 to analyze if the effect of collaboration on product innovation would be higher in foreign rather than domestic companies. We find support for our Hypothesis 1 provided that the coefficient of the interaction term between the variables. COLLABORATION*FOREIGN is positive and statistically significant in radical innovations. The impact of collaboration remains positive and significant, but the effect of the foreign nationality of the company becomes insignificant in the development of novel products. This makes us believe that foreign firms' superiority in radical innovation relies mainly on its superior ability to benefit from collaboration, rather than its international nature. According to incremental innovations, collaboration is negative and significant, while foreign nationality does not have a significant effect. Consequently, the collaboration of foreign firms does not have a higher positive impact on incremental product innovations than the collaboration of domestic firms; therefore, COLLABORATION*FOREIGN is not significant in achieving less novel innovations. The effect of the control variable PROPAT on the likelihood of achieving innovations is positive and significant in the case of radical innovations. The variable for EXPSHARE has a positive and significant effect on the development of radical innovations, while it takes a negative and significant value in incremental innovations. The size of the firm controlled by NETSALES is a positive and significant factor for the achievement of less novel innovations.

Table 3 presents the estimated results for the impact of different types of geographical collaborations on the degree of novel product innovation; and the significance of nationality in determining geographical collaboration impact on product innovation. The ρ parameter is highly significant, this supports the choice of biprobit instead of the probit model. The Wald test also points out the high significance of both variables for the models.

Model 2a estimates the impact of different types of partnerships according to geographical location in firms located in the CAPV. Results suggest that the effect of collaboration depends on the type of partner.

Table 3. Geographical collaboration impact on product innovation

	Model 2a		Model 2b	
	RADICAL	INCREMENTAL	RADICAL	INCREMENTAL
REG	0.369**	-0.280	0.324**	-0.226
INTER-REG	0.968***	-0.320	0.507	-0.578
DIVERSEREG	0.709***	-0.181	0.672***	-0.227
FOREIGN	0.174**	0.009	0.181	-0.152
REG*FOREIGN			0.455	-0.569
INTER-REG*FOREIGN			1.401**	1.029
DIVERSEREG*FOREIGN			0.548	5.385
GROUP	-0.150	-0.024	-0.165	-0.023
R&DEXP	-0.054	0.009	-0.055	0.009
PROPAT	0.730***	-0.205	0.732***	-0.231
EXPSHARE	0.422*	-0.620**	0.475**	-0.508**
NETSALES	0.005	0.072**	0.006	0.074**
INDUSTRY DUMMIES	Significant			
LR rho=0	39.810		41.561	
Wald test of full Model	309.690		308.600	
Log pseudolikelihood	-910.318		-902.871	
Number of observations	1290		1290	

One-tailed t-test applied.   ***$p > .01$ **$p > .05$ *$p > .10$

While exclusive regional collaboration (REG) has a positive and significant effect on the development of radical product innovation, exclusive inter-regional collaboration (INTERREG) does not have a significant impact on the achievement of novel products. As expected, diversity in geographical collaboration (DIVERSEREG) has the largest positive effect and significance in the achievement of radical innovations. Therefore, we can confirm our Hypothesis 2a related to the highest significant impact of heterogeneous geographical networks in the development of new products.

Model 2b estimates the impact of different geographical technological networks in product innovation according to foreign nationality. In order to analyze this issue, we create three interactions capturing the effect of different geographical networks in foreign firms: REG*FOREIGN, INTERREG*FOREIGN, DIVERSEREG*FOREIGN. The introduction of these interactions allows us to

isolate the effect of collaboration performed by foreign firms in product innovation. Through the application of these interactions we can confirm our Hypotheses 2b. Foreign firms' advantage on geographical collaboration relies on inter-regional collaboration, INTERREG*FOREIGN is positive and significant in the achievement of novel products. However, foreign firms do not take a higher advantage from exclusive regional or diverse geographical networks than domestic firms, as long as REG*FOREIGN, DIVERSEREG*FOREIGN does not have a significant effect.

According to the development of incremental innovations, neither the type of geographical collaboration nor foreign-collaboration interactions have a significant impact.

The effect of control variables is similar to the previous model.

Table 4. Knowledge-based collaboration impact on product innovation

	Model 3a		Model 3b	
	RADICAL	INCREMENTAL	RADICAL	INCREMENTAL
SCIENCE	-0.408**	0.106	-0.523**	0.046
COMMERCIAL	0.389**	-0.441**	0.220	-0.478**
DIVERSEKNOW	0.949***	-0.136	0.923***	-0.189
FOREIGN	0.526**	0.006	0.261	-0.245
SCIENCE*FOREIGN			0.650	4.575
COMMERCIAL*FOREIGN			1.540**	0.384
DIVERSEKNOW*FOREIGN			0.252	0.785
GROUP	-0.131	-0.020	-0.143	-0.032
R&DEXP	-0.044	0.009	-0.046	0.009
PROPAT	0.696***	-0.230	0.695***	-0.250*
EXPSHARE	0.472**	-0.648**	0.524**	-0.605**
NETSALES	0.004	0.076**	0.002	0.074**
INDUSTRY DUMMIES	Significant			
LR rho=0	42.350		44.354	
Wald test of full Model	321.850		324.440	
Log pseudolikelihood	-901.416		-894.226	
Number of observations	1290		1290	
One-tailed *t*-test applied.	***p > .01	**p > .05	*p > .10	

Table 4 presents the estimated results for the impact of different types of knowledge-based networks on the degree of novel product innovation, and the significance of nationality in determining the knowledge-based collaboration impact on product innovation. The ρ parameter is highly significant, supporting the choice of biprobit instead of the probit model. The Wald test also points out a high significance of both variables for the models.

Model 3a assess the impact of different types of knowledge-based technological partnerships in firms located in the CPAV. Results suggest that the effect of collaboration on novel innovation depends on the type of partner.

As posited in the theory, exclusive science collaboration (SCIENCE) has a negative and significant effect on the development of radical product innovation; while commercial collaboration (COMMERCIAL) has a positive but insignificant impact on the achievement of novel products. The largest positive effect of knowledge-based networks is found in diverse partnerships (DIVERSEKNOW), which are positive and significant in the achievement of radical innovations. Therefore, we can confirm our Hypothesis 3a related to the highest significant impact of diversity on knowledge-based networks in the development of new products.

Model 3b estimates the impact of different knowledge-based networks on product innovation according to foreign nationality. In order to analyze this issue, we create three interactions capturing the effect of different knowledge-based networks in foreign-owned firms: SCIENCE*FOREIGN, COMMERCIAL*FOREIGN, DIVERSEKNOW*FOREIGN. The introduction of these interactions allows us to isolate the effect of collaboration performed by foreign firms on product innovation. Through the application of these interactions we can confirm our Hypotheses 3b. Foreign firms obtain greater performance than domestic firms on commercial collaboration, COMMERCIAL*FOREIGN is both positive and significant in the achievement of novel products. This result confirms previous literature about firms' commercial collaboration in spatial clusters. Malmberg (2003) pointed out the disappointing results of commercial collaborations within clusters, and the increased attention to more informal unintended interactions.

According to the development of incremental innovations, only exclusive commercial collaboration is significant, which is a negative sign. Exclusive science collaboration has a positive but insignificant effect, and diverse knowledge-based networks have a negative but significant effect. Looking at foreign firms' advantage from knowledge-based networks, any foreign-collaboration interaction has a significant impact on the achievement of incremental innovations. Once again, the effect of control variables is similar to the previous model.

Discussion and conclusions

Economic development is connected with the generation of innovation. Collaboration has been largely considered as an important enactor of firms' innovation ability. However, relevant literature is equivocal about the impact of different type of networks on innovation output.

In this sense, firms' particular context will dictate the best collaboration pattern to achieve a higher rate of innovation novelty. This research focuses on the development of an effective collaboration pattern for firms located in the Basque Country. Traditionally the Basque Country has been considered an example of a geographical cluster. The aim of this paper is to understand why domestic firms achieve lower innovation performance than foreign firms located in the CAPV. Specifically, we assess whether the nature of the knowledge base (defined by a firm's nationality) moderates the impact of technological collaboration agreements on the degree of product newness. Therefore, we assess differences in the way these two groups of firms organize their technological collaboration practices and the comparative differences that stem from their respective practices.

This study confirms that collaboration strategies developed by foreign firms have a higher impact on achieving novel innovation (Frenz and Ietto-Gillies, 2004). In order to explore the source of this foreign advantage, we analyze how firms benefit from different networks (according to geographical and knowledge-based dimensions). This distinction between technological networks leads us to explore traditional cluster advantages focused on geographical proximity and specialized industry collaborations.

Firstly, when we focus on technological geographical collaboration we find that diversity in the make-up of geographical networks favors innovation novelty more than collaboration with a single type of geographical partner does. This is in line with recent cluster literature focused on spatial collaboration diversity (Boschma, 2005). By considering the individual impact of each type of geographical partner, results confirm that regional partners are the single partners who have the biggest impact on the achievement of novel product innovation. This is consistent with the argument that short distances across collaborators benefit from knowledge externalities (Jaffe et al. 1993; Audretsch and Feldman, 1996; Boschma, 2005).

Looking at foreign firms' superiority in innovation performance, we find that inter-regional collaborations seem to be the key source of advantage. Being part of a MNC allows affiliates to be involved in a multinational network and develop an open-vision of spatial collaboration. Thus, foreign firms benefit from inter-regional collaborations due to their international learning ability (Phene and Almeida, 2008; Lowe and Wrigley, 2010; Ebersberger and Herstad, 2011).

Second, knowledge-based technological collaborations may be a make-or-break decision for the success of novel innovations across firms located in the CAPV. Our results show that diversity in knowledge networks has the greatest positive effect on radical innovations. Being integrated in a diverse knowledge-based network allows firms to benefit from generic knowledge from scientific partners in order to explore new knowledge, but also from commercial collaborators exploiting current specialized knowledge.

Looking at foreign firms' superiority in innovation performance, we can confirm commercial collaborators as a source of innovation advantage. Foreign firms have a greater chance of combining dissimilar and complementary knowledge in commercial-based collaborations. Therefore, these commercial partnerships developed by foreign firms enable them to profit from a variety of specific knowledge (across MNC and the host country) with a positive impact on novel innovations creation.

We contribute to literature exploring new global dynamics of collaboration in firms located in geographical clusters. In this sense we challenge traditional cluster assumptions by estimating the impact of difference on innovation novelty. Traditional cluster literature has stressed the rigid "local" focus; however, we take a contemporary vision by integrating ownership nationality in geographical cluster research. The introduction of foreign companies in regional systems research has been neglected due to the particular attention paid to locally owned medium-sized firms, while MNC are seen as alien in the idea of a dynamic spatial cluster (Malmberg, 2003). We provide a global pattern of effective collaborations and determine the foreign firm's collaboration advantage. In this sense, firms located in the Basque Country should encourage diversity in geographical and knowledge-based networks.

This study is a novel empirical study in the cluster theory, traditionally focused on the development of case-studies. Malmberg (2003) already suggested the importance of assessing the implications of global and local circuits in an empirical way.

Our findings provide useful managerial implications. Managers should be aware of the importance of parent choice and the diversity of collaboration strategy in order to achieve sustainable innovation. Furthermore, managers should look at gaining advantage from inter-regional and commercial partnerships in order to gain competitiveness from foreign firms. As pointed out above, radical innovation is essential for organizational competitiveness.

From the point of view of policy-makers, its mission is essential in promoting efficient practices. As long as the Basque Country is the result of an efficient regional policy, regional policy-makers should encourage a sustainable innovation strategy. In this sense, they should encourage

science organizations to develop generic knowledge closer to domestic firms' background to motivate innovation development. In the same way, regional government should explore the rationale behind informal commercial transactions in order to promote a commercial collaboration efficient pattern. According to geographical collaboration, inter-regional partnerships should be supported, allowing firms to develop an open geographical perspective.

Finally, this work is not free from limitations. It would be interesting to enlarge empirical analysis through a larger sample from different periods. Due to data availability we have focused the analysis on product innovation, but it would be interesting to replicate this study regarding other types of innovation (process, organizational, commercial) and extrapolate global conclusions. The results warrant further study of geographical and knowledge-based networks at different levels and analyze its implications in innovation performance. Related to the empirical validation of the model, our findings could be supported by the development of an in-depth case study. Finally, although radical innovation is the most powerful source of innovation performance, we cannot underestimate the role of incremental innovation, as long as this is the dominant form of innovation. Moreover, the diffusion of radical innovations nearly always depends on incremental improvements, refinements and modifications, the development of complementary technologies, and organizational change and social learning. In the same way, the contributions of incremental innovations to address socioeconomic challenges are substantial and may be even more important in a development context. Therefore, it would be interesting to go further on the implications of different collaboration agreements on different degrees of incremental innovation.

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Biographical Note

Henar Alcalde Heras holds Doctorate in Business Administration and Quantitative Methods (European Mention) from the University of Carlos III, Madrid. Part of doctoral studies she conducted at the Copenhagen Business School in the Department of Innovation and Organizational Economics (INO). Since 2011 she acts as researcher at Orkestra-Basque Institute of Competitiveness, and teaches at Deusto University Strategy Deparment. Previously she has been teaching in the Business Economics Department at the University of Carlos III, Madrid. Her principal areas of interest are subjects relating to Open Innovation Strategy. In particular, the analysis of collaboration between different agents, knowledge management, technology transfer and the final impact on the results for innovation achieved by the company.

Abstrakt (in Polish)

Zdolność do tworzenia innowacji uznawana jest w coraz większym stopniu za czynnik wyjaśniający konkurencyjność przedsiębiorstw w długim okresie. w konsekwencji wzrasta znaczenie czynników decydujących o powstawaniu przełomowych innowacji produktu. w artykule, na podstawie zestawu wskaźników konkurencyjności, bada się wyniki osiągane przez firmy lokalne i zagraniczne w Kraju Basków, wskutek stosowania przez nie określonych metod współpracy w dziedzinie technologii. w badaniu dąży się w szczególności do określenia różnic w zakresie sposobów organizowania przez te dwie grupy przedsiębiorstw technologicznej współpracy (tj. geograficznego pochodzenia partnerów oraz celów tej współpracy: komercyjnych lub naukowych i nakierowanych na generowanie wiedzy) oraz różnic w zakresie rezultatów tych praktyk. w studium wykorzystano dane z sondażu działalności innowacyjnej przedsiębiorstw w kraju Basków w 2011 roku. w wyniku badań stwierdzono, że (a) technologiczna współpraca,

która angażuje zróżnicowane grupy partnerów ma największy pozytywny wpływ na poziom nowatorstwa innowacji, oraz (b) biorąc pod uwagę narodowość firm, strategie współpracy rozwijane przez firmy zagraniczne mają większy wpływ na osiąganie nowatorskich rozwiązań. Można przyjąć założenie, że wyższy poziom innowacyjności charakteryzujący firmy zagraniczne w kraju Basków w relacji do firm lokalnych, wynika ze zdolności firm zagranicznych do wykorzystywania w rozwoju innowacji zarówno partnerstwa wewnątrz regionu, jak i powiązań międzyregionalnych i sieci biznesowych.

Słowa klucze: *współpraca, nowość produktu, narodowość własności, innowacja*

University-industry collaboration in the European regional context: the cases of Galicia and Apulia region

Manuel González-López[1], Ivano Dileo[2], Francesco Losurdo[3]

Abstract

Universities are one of the key actors within national and regional innovation systems. The nature of university-industry collaboration has changed during the last decades and it varies across countries and regions. Different factors determine the interaction among both organizations, from those related to the industrial structure of the territory to others related to institutional and legal frameworks. In this paper we aim at adding to the understanding of this process based on the comparison between two European regions (nuts-2), Apulia in Italy and Galicia in Spain. Our results show that a progressive transition from a separated to a more integrated approach has occurred at the relational framework affecting universities and industry in both regions. Public policies, particularly from the regional level, have been relevant for promoting university-industry collaboration in Galicia and Apulia.

Nevertheless, there still remain cultural and institutional barriers, both from the academy and business sphere, which impede a narrower and more fruitful interaction. Besides, the poor innovative culture of traditional industries which dominate in both regions, might affect university-industry interaction. However, an adjustment of the university offer in terms of research is also needed as we observe that collaboration is too much biased by the university scientific and departmental specialization and too little by local and regional industrial specialization.

Keywords: University, industry, collaboration, regions.

Introduction

The experience demonstrates that a mutual integration between university and industry can foster the development of the communities in which both are operating (Camagni, Maillat and Matteaccioli, 2004). Moreover,

1 Manuel González-López, PhD, Lecturer and Researcher of Economics, ICEDE Research Group, University of Santiago de Compostela, Department of Applied Economics, 15782 Santiago de Compostela, Spain, manuel.gonzalez.lopez@usc.es.
2 Ivano Dileo, PhD Lecturer in Economics, University of Bari, Department of Political Science, University of Bari, 70121 Bari, Italy, dileoivano@gmail.com.
3 Francesco Losurdo, Professor of Economics, University of Bari, Department of Political Science, University of Bari, 70121 Bari, Italy, francesco.losurdo@uniba.it.

important changes have happened in the rationale of university-industry relationship during the last decades (Gibbons et al., 1994; Etzkowitz and Leydesdorff, 2000). In general terms a tendency towards a narrower interaction among universities and companies has been observed, a trend that has changed rules and behaviours at both organizations. Nevertheless, such process is far from being a universal and barrier-free trend as economic, cultural and institutional factors may hinder or foster it. In many countries and regions, science remains an open system, governed by rules and practice set by the scientists themselves. Conversely, industrial research is likely to be specific in orientation and firms are focused on creating private and valuable knowledge that can be used to set-up process and produce goods. Although both university and industry have mutual interest in knowledge and research abilities formation and in technology transfer as well, they sometimes operate separately and follow different ways. The nature of university-industry collaboration varies also across countries and regions because of different factors, from those related to the industrial structure of the territory to others related to institutions and legal frameworks.

In this paper we look at two experiences of university-industry cooperation at the regional level. For this goal we have chosen Apulia in Italy and Galicia in Spain. They are both NUTS II European regions, characterized by a similar research infrastructure focused on public universities, with a leader one (Bari in Apulia and Santiago de Compostela in Galicia), as well as an industry largely formed by SMEs based on traditional manufacturing. We aim at adding to the understanding of how institutional and productive specificities shape the collaboration between university and industry. In particular, we will try to answer the following questions:

a)   to what extent universities in Apulia and Galicia have moved towards a more integrated model of interaction with industry and,

b)   how the institutional set-up and the productive specificities of each region shape the relationship between universities and industry?

The paper goes as follows. First, we briefly discuss the literature about university and industry collaboration as well as its role on regional development. In the second and third section we present the major features of university-industry collaboration in Galicia and Apulia region respectively. We focus on the institutional and legal framework affecting interactions among both organizations as well as on the particularities of regional innovation and industrial structure. In the last part of both cases we present some recent evidence about the different channels of interaction among universities and industries.

We end with a conclusion part where we try to extract the main lessons about the comparison of the Galicia and Apulia cases.

Literature review

University transition from "mode 1" to "mode 2" of knowledge production and the determinants of university-industry relationship

The university-industry relationship has been largely discussed by the literature on industry and innovation during the last decades. Such relationship is considered of high relevance for local and regional development as knowledge has been increasingly pointed out as a key factor for economic progress (Boucher, Conway and Van Der Meer, 2003; Gunasekara, 2006; Uybarra, 2010). Several studies have pointed out the basic role of the knowledge infrastructure for creating structural interdependencies with the industry (Alavi and Leidner, 2001; Basant, 2002; Bathelt, Malmberg and Maskell, 2004). In this sense, there is a growing awareness of the importance that university can undertake, especially at regional level (Fini, Grimaldi, Santoni and Sobrero, 2011).

Agreeing with Carlsson (1997) and Carlsson, Jacobsson, Holmèn and Richne (2002), this can include the generation of applied scientific knowledge that can be used by local high-tech industry attracting knowledge based firms to relocate into regional system (Castells and Hall, 1994) and create additional employment opportunities within the local labour market (Acs and Audretsch, 2003).

The impact of university-industry interactions on regional development became even more important since higher education institutions moved from a traditional role, focused on basic research and training, to a new role more involved in innovation and productive tasks. Such change has been well described by Etzkowitz and Leydesdorff (2000), among others, referring to the new role of universities as one inserted in a "Triple Helix Mode" of innovation. In such a model, universities will be one blade, together with firms and governments, for the development and use of new knowledge in the economy and so for promoting competiveness and economic progress. Under this view new functions of universities are emphasised such as technology transfer, spin-off creation, patent licensing, etc.. More recent contributions have somehow renewed the "triple helix" idea pointing to the existence of a "quadruple" and even "quintuple" helix innovation model (Carayannis and Campbell, 2011). Thus the quadruple helix mode will incorporate media, culture and the civil society perspective into the process of knowledge creation and innovation whilst the quintuple mode will do the same with the natural environments of society.

According to Gibbons et al. (1994) the growth and spread of higher education after the Second World War was hand to hand with a change in

the view of university roles in society. It would begin with a world where universities were the ones providing basic knowledge (from basic science) to large-scale industry, relying upon a linear model of innovation where both actors were clearly separated and showed completely different rationality. a second phase, beginning in the late 60s, will emphasise the role of applied science and knowledge produced by universities and so its dissemination and applications. The importance of linking higher education institutions and the productive systems, despite belonging to two different spheres, increased. a third stage will emphasize even more the role of technological innovation for competitiveness and so the removing of barriers and bottlenecks between the scientific enterprise and industrial innovations. Finally, since the 90s, industrial policy, science and technology policy and regional policy converged towards a common innovation policy. In this context, universities entered the scenario as major players for the creation of a knowledge-based economy. Higher education institutions created and participated in science and research parks, cooperative research centres and consortia with industry, business incubators, etc.

The new and fashionable concept is the "entrepreneurial university" (EDU, 2007). Gibbons et al. (1994) describes such transition of universities from a "Mode 1" of knowledge production, which is governed by the academic community and its rules, to a "Mode 2" of knowledge production resting on a bidirectional connection between academy and society in which the boundaries between the two worlds are blurring.

Transition from "Mode 1" to "Mode 2" is narrowly linked to the participation of universities as actors in the "triple-helix" model, particularly within regional innovation systems. The innovation system approach views innovation as a collective process where regional innovation emerges from localized and institutional supported networks.

Such a "regionalization" of the phenomenon of innovation explains also the trend towards regionalization of S&T policy and governance. Universities, together with firms and regional governments would hence be key actors with the regional networks of creating, disseminating and using knowledge for economic purposes and so they will shape the evolution of the regional economies.

Regional innovation systems can be both viewed from a top-down and a bottom-up perspective (Howells, 1999). From a bottom-up perspective, the concept of regional innovation system links to the economic geography literature where proximity and networking are determinant factors for explaining local and regional development. In this sense, universities might take part (or not) of industrial clusters as part of the networks participating in knowledge production and diffusion and for the creation of spill-over effects.

Such localized clusters, not necessarily uni-sectorial, would follow a trajectory and will be also narrowly shaped by social, cultural and institutional factors.

In this case, the term "region" rests mainly on a geographical dimension as sometimes such clusters can be localized in border spaces of two different countries.[4]

On the other hand, from a top-down perspective regional innovation systems will be conceived similarly than national innovation systems, so their delimitation will rest on the regional governance structure (formal institutional specificities), as well as on productive issues referring to industrial specialization and core/periphery differences.

According to this view, we can argue that the role of universities in innovation systems will be firstly determined by existing regional regulations affecting higher education, secondly, by the industrial specialization profile of the region. The definition of "region" from this perspective refers largely to a historical or administrative space, i.e. formal institutions like governments and legal frameworks are relevant. In this paper, considering the nature of the two regions compared, we will take this last perspective (top-down).

The changing role of universities in regional development that has been observed in many countries is shaped from our viewpoint by two different factors. First of all, the specificities of the institutional set-up where universities are embedded are relevant, as transition from mode-1 to mode-2 might be burdened by institutional resistance. In many cases a change in the institutional set-up and legal framework affecting universities will be needed in order to adopt new roles. At the same time, legal frameworks and their modifications are embedded in national and regional institutional realities that differ from one territory, even from one university, to another. Therefore, in order to understand the impact of university-industry relationships on regional development we must analyze such institutional and legal framework in depth.

Second, the specificities of the regional industrial structure, as not all sectors present a similar propensity to use university knowledge, also matter (Gonzalez, 2000).

Industries and sectors differ in their innovative character or in the type of knowledge used. Isaksen and Karlsen (2010) point out that the role of universities for regional development is determined by the dominant mode of innovation of the regional industry, distinguishing between DUI (doing, using and interacting) and STI (science, technology and innovation)[5]. When

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4 The GREMI school refers to a similar concept than the one used here labelled as "Millieux Innovateurs", Aydalot (1986).
5 The STI-mode operates mainly on the basis of the codified knowledge while the DUI-mode operates mainly on the basis of experience based learning by doing, using and interaction (Lundvall, 2006).

comparing the case of two Norwegian universities, Tromso and Agder, they conclude that the dominant mode of innovation in a regional industry makes a difference to the role universities can play in stimulating the development of the industry. For instance, cooperation is more easily found if STI dominates in the regional industry than if DUI dominates. Such results nevertheless contrast with the view raised by Lundvall (2006) when he points out that: in the current period where protection of codified knowledge has become a major concern of rims that are world leaders in advanced technology this might not be the case. The STI-mode resulting in disembodied codified knowledge may actually result in more restrictive access than the DUI-mode where the final product is a new system or product with embodied but unprotected knowledge (p. 22).

Discussion

University-industry collaboration and the institutional framework in Galicia

There are three universities in Galicia, the centenary University of Santiago de Compostela (USC) established in 1492 and the Universities of Vigo (UVIGO) and a Coruña (UDC), which were created in 1990 as a disaggregation of the University of Santiago. The USC is the largest of the three institutions both in terms of number of students and personnel as well as regarding the number of departments and research groups. In regard with the main research areas, there is a certain complementarity among the three universities although some overlapping is also found particularly in the field of social sciences. The USC shows a strong specialization on health sciences and also on classical disciplines from different fields (Law, Economics, Philosophy, Languages, Biology, Chemistry, etc). The UVIGO is the one with more focus on technology and industrial engineering whilst the UDC major distinctiveness refers to Architecture and Civil Engineering and Computer studies.

There are two key milestones referred to institutional changes that are relevant for the evolution of the relationship between university and industry in Galicia. The first one refers to the approval of two laws at the national level. The first one is the law for the University Reform approved in 1983, which regulated the collaboration between the academic staff and companies through contracts and collaborations agreements. Secondly, the Law for the promotion and general coordination of scientific and technical research, published in 1986. This law includes the objectives of promoting the knowledge and technology transfer from universities to the productive system and creates the conditions for the set-up of offices in charge of such

function (TTOs) in most universities. As a result, and supported by the National Plan of R&D, the number of TTOs at universities strongly increased in a short period of time reaching 40 1992. In Galicia, each of the three universities established their office in 1991. According to Rubiralta (2007), since year 2000 an evolution of the TTOs has been observed as they increasingly adopt a rather complex structure and more functions. This author considers this trend as a common one for many European universities in such a way that apart from the traditional function, some others can be identified such as patents management, technology-based companies promotion, entrepreneurship promotion, Spin-offs management and promotion, capital-risk functions, technological incubators set-up and participation in technological and scientific parks.

Table 1. Galician Universities (2012)

	Students/Scientific Staff	Departments/Research Groups	Main Research Areas
USC	30.159/2.094	75/355	Health Sciences Natural Sciences Social Sciences Humanities
UVIGO	22.103/1.472	47/252	Technology and Industrial Engineering Social Sciences Natural Sciences
UDC	22.819/1.448	43/126	Social Sciences ICT Architecture and Civil Engineering Ship-building Engineering

Source: Own-elaboration.

The second key institutional milestone refers to the regional (Galician) level and particularly to the publication of the Law for the promotion of research and technological development in 1993 as well as the subsequent first Galician Plan for research and technological development in 1999. The delay in the launching of the plan reflects the difficulties to establish a coherent and integral strategy for R&D in the region. In fact, as pointed by Conde-Pumpido (2007), the first measures to articulate the Galician innovation system and the relationship between universities and firms were only included at the second Plan (2002-2005). According to the previous author the regional policies implemented during the 90s rested on the separation between the scientific and technological spheres, with the public R&D system as dominant

actor; whilst in the second RTD Plan (Conde-Pumpido, 2007) an evolution towards a rather technological and entrepreneurial model was observed (p. 80). As a consequence the collaboration between universities and industry increased at their different forms.

The plan supported the TTOs of the universities as well as different structures to promote the commercialization of research results or the establishment of technological based companies. Many of the investments of the related infrastructure were financed by EU funds.

Apart from the legal development indicated above there are other landmarks that determined the relationship between universities and industries in Galicia. One of them refers to the establishment of the Galician University-Firms Foundation in 1982 that join together the main regional firms and the University of Santiago de Compostela (the only existing at that time) to promote the collaboration between universities and industry. Its activities were largely focused on supporting the incorporation of graduates in Galician companies as well as research and consultancy contracts between research groups and firms. Another important issue refers to several initiatives taken by the University of Santiago de Compostela at the end of the 90s and beginning of the 2000s.

One of them was the establishment of the first university spin-off incubator in Galicia, UNINOVA, in collaboration with the local authorities. The other was the setting up of UNIRISCO, a venture capital society aimed at providing financial support to universities spin-offs, which was created in collaboration with relevant Galician companies and financial institutions, and that later incorporated also the Universities of Vigo and a Coruña.

Regional innovation and industrial specialization of Galicia

Galicia shows a moderate-low innovative profile in the European context (EU, 2014).

During the 90s and the first decade of the current century, R&D expenditure on GDP continuously increased its share on GDP reaching 1% in 2008, when the crisis broke out. Since that year there has been a slight decreasing in this indicator and at the moment is lower than half of the EU-27 average. Differences with the EU are even larger when dealing with Business R&D expenditure, which is approximately half of total R&D expenditure. Finally, patent activity is even lower than the previous indicators as the average patent application to EPO per million inhabitants was around 12 per year between 2006 and 2010, ten times lower than the EU average. The innovative performance is closely linked to productive specialization and, as

we will see below with more detail, Galician economy shows a relatively low presence of high-tech sectors.

Table 2. Main innovation indicators of Galicia and EU-27

	Galicia	EU-27
Population (2013)	2.761.989	501.403.599
GDPpc (PPS) (2011)	21.800 €	24.600 €
Unemployment Rate (2012)	20,5	10,4
R&D Exp/GDP (2011)	0,94	2,01
Business R&D Exp/GDP (2011)	0,46	1,24
Patent Applications to EPO per million inh (Aver. 2006-2010)	11,94	111,56
High-Tech Sectors (% Total Employment) (2011)*	5,7	10

* High-Tech Manufacturing + High-Tech Knowledge intensive services
Source: Eurostat..

The Galician economy could be included within the group of late industrialised and peripheral European regions as it remained dominated by primary sectors until the 70s and manufacturing boomed only during the second half of the last century. Nowadays the peripheral character of European regions shows a rather different profile than the one it used to show. As pointed by Vence-Deza and González-López (2008), the peripheral character of European regions is now shown by a stronger presence of low-tech manufacturing industries and traditional or non-knowledge intensive services.

This is also the picture on the Galician industrial structure in comparison with the EU-27 and, to a less extent, with the Spanish one. Thus, the Galician manufacturing sector is dominated by food production, with a long tradition on seafood production, textiles and wearing apparel where successful companies like Inditex (Zara) became large MNEs, wood and derivates and non-metallic mineral products. Together with the previous branches, the manufacturing of vehicles and ships represent the core of the Galician manufacturing specialization. High-tech manufacturing like computer and electronic products, electrical equipment, machinery and equipment or chemical and pharmaceutical products are poorly present in the Galicia economy. Regarding services activities, the presence of knowledge intensive services is comparatively low in Galicia , particularly when dealing with knowledge intensive business services like R&D activities, computer and related activities or telecommunication. According to Gonzalez-López (2009) in a study made for the Spanish case, such services are usually concentrated

at capital and metropolitan regions from which they are "exported" to peripheral regions with less developed knowledge intensive business services.

Figure 1. Relative industrial specialization.
Galicia/EU-27 and Galicia/Spain (2010)

Relative Specialization Galicia/EU-27 and Galicia/Spain
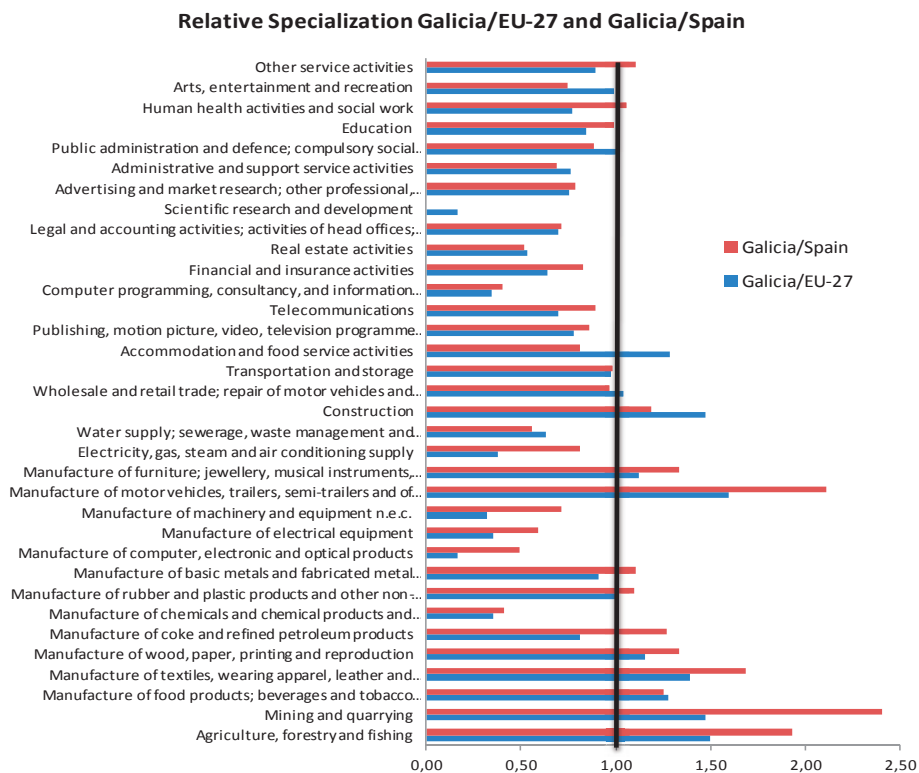
Source: Own-Elaboration based on IGE (Galician Statistical Institute) and Eurostat data.

University-industry interaction in Galicia: recent evidence

A few studies have analyzed the connection between businesses and universities in Galicia during the last decades (Vence-Deza, 1992; Conde-Pumpido, 2007). In a study made for 1998 and 1999, González-López (2000) pointed to certain structural deficiencies of university-industry collaboration in Galicia due to the specialization on low-tech and traditional sectors as well as the lack of specific public support. These deficiencies were shown on the poor connections between them, based mainly on fragmented R&D contracts and services. Another barrier found, as also pointed out by Vence-Deza (1992), referred to the different interests and institutional behaviours of both partners.

In the present research we have collected data from the three Galician universities about the different channels of interaction with industry (including public bodies). Some of this data is published and freely accessed from the universities web-sites while other was collected from the universities TTOs. At the same time we have interviewed the directors of the three universities TTOs in order to obtain qualitative insights from the characteristics, evolution and barriers of university-industry collaboration in their universities and in Galicia as a whole.

Table 3 sums up the evolution and the current state of three different channels of collaboration between university and industry in Galicia. These channels are R&D contracts and services, patent applications as well as spin-off creation. We have analysed the period 2007-2013 in order to obtain some insights about the impact of the crisis bursting in 2008. It is important to note here two aspects. First, both patent activity and spin-off creation are quite recent phenomena (particularly the last one), for this reason previous studies like some of the ones mentioned above did not contemplate it. Second, interactions for training and educational purposes are not included here as it is a pending issue in the Galician innovation system. Such interactions refer only to short and not-paid interships at companies and public bodies (1-3 months) during bachelor and master degrees that in many cases are just a requisite to obtain a degree. We do not find, in contrast with other European countries, experiences of companies funding PhD programmes or similar initiatives. Referring to the pointed channels of interaction we have observed that during the last two decades R&D contracts and services between universities and industries have grown both in terms of number and their economic amount. This growing tendency has only disappeared due to the impact of the economic crisis beginning at the end of 2008, as observed in the table. Only a tiny recovery is noted since 2012. When dealing with patent applications a growing tendency is also observed in the period analyzed, although the numbers are still quite poor when comparing with European universities. The impact of the crisis does not seem to be relevant, something that is quite understandable as the patent applications are usually the final stage of long-term research (so there is time-gap and the crisis could affect patent activity during coming years).

Finally, when dealing with spin-offs creation an increasing trend is also observed even during the period of crisis. In some cases this might be explained by the reduction of public funds for research that brought some researchers to become entrepreneurs. In any case spin-off creation is, as mentioned above, a relatively recent phenomenon that in the cases of UDC and UVIGO began in mid-00s, thanks to the support of a specific regional programme. The main knowledge fields and economic sectors of collaboration vary from

one university to the other, according chiefly to their specialization profile. Most active knowledge fields in the USC refer to health, biotechnology, ICT and environmental S&T. In the case of the USC, the interaction with the economy takes a rather cross-sectoral profile, not aimed specifically to one economic sector. Only in the case of health sciences we find a specific sector of interaction that is the (regional) public health system, since the presence of private health companies is quite modest. Other activities like the food industry as well as fishing and aquiculture sector used to be among the most collaborative ones; nevertheless their relevance as R&D partners has recently decreased due to different reasons. The geographical space of reference is the Galician economy as a whole as there is not a strong local specialization in any industry. Regarding the UVIGO, the outstanding knowledge fields are industrial engineering, marine sciences and ICT. In relation to the economic sectors more prone to collaborate we find a closer relationship with the local environment, as the city of Vigo shows an important industrial tradition in the regional context. The major sectors are the automotive auxiliary industry, with strong presence in the city of Vigo, as well as the food industry (both sea-food and agrarian related). Finally the ship-building industry, also relevant in the area of Vigo, is another major partner of the university. To end with, the UDC main knowledge field of collaboration are ICT (due to the presence of computer studies), civil engineering and natural resources and environment. This university is probably the one with the poorest connections with its industrial (local) environment and only the ship-building industry shows certain commitment with R&D collaboration. Like the case of Santiago but in a sensible minor scale, the interaction with the productive system in this case is mainly cross-sectoral, linked to ICT and environmental technologies.

Table 3. Channels of interaction between Galician universities and industry

		Average 2007-2008		Average 2009-2011		Average 2012-2013		Main Knowledge Fields of Collaboration	Main Economic Sectors of Collaboration
		Number	Amount (000 €)	Number	Amount (000 €)	Number	Amount (000 €)		
USC	R&D Contracts	384	18.176,00	246,7	9.933,67	593	9.690,00	Health and Biotechnology	Health (Public sector)
	Patent Applications	28.5	-	46.6	-	41	-	ICT	Food Industry
	Spin-Off Creation	2,5	-	2	-	3.5	-	Natural Rces & Environment	Fishing and aquiculture

UVIGO	R&D Contracts	218	9.148,50	183	6.359,47	132	6.184,31	Industrial Engineering	Car industry
	Patent Applications	14	-	19	-	23	-	Marine Sciences	Ship-building industry
	Spin-Off Creation	3	-	2,3	-	3	-	ICT	Food Sector
UDC	R&D Contracts (*)	272	8.841,50	260	6.125,55	210,5	6.721,31	ICT	ICT sector
	Patent Applications	10	-	8.6	-	15.5	-	Civil Engineering	Ship-building industry
	Spin-Off Creation	1	-	1	-	3	-	Natural Rces & Environment	

(*) including technical reports.
Source: Own-elaboration based on OTRIS data and interviews.

Strengths and weaknesses of university-industry collaboration in Galicia: a qualitative view

According to the directors of the TTOs interviewed, the traditional distrust among companies and universities has somehow reduced during the last years, explaining the growing trend of interactions. This has been a progressive process where the beginning of the interaction, sometimes based on small services or consultancy, is seen as a key milestone as it might derivate in more complex collaborations. At the same time, there have been changes in the institutional arrangements (formal and informal) affecting universities views of interactions with industries. These changes refer first of all to the normative and legal developments already mentioned in previous sections but also, according to the TTOs directors views, changes at the behaviour of research and academic personnel are observed. There of course persist barriers referred to the specific culture and norms of academy that, in some cases like the ones related to ideological issues, are hard to overcome. In fact, the debate about the privatization of university (public) knowledge is still a major and open issue when analyzing university-industry interactions. Besides, one of the persons interviewed highlighted the poor value given by the Spanish academy to transfer activities and achievements.

Other weaknesses regard specific legal and normative aspects. One of them refers to the difficulties to make compatible the entrepreneurship activity of researchers with their function in the academy. This is largely due to the specificities of the legal framework affecting labour relationships of public workers. The other factor refers to the inner normative of universities affecting R&D contracts, patent activity and spin-off creation. The UDC and the UVIGO have just very recently approved the specific normative regulating these aspects whilst the USC still lacks the one referring to patent and spin-off activities. Such lacks do not impede to develop the mentioned

transfer activities as not-written norms are applied. Nevertheless such "legal vacuum" might act as an obstacle in the future. Finally, the administrative and managerial structure for university industry interactions is another important aspect affecting such interaction. In our case, each university owns a specific structure. At UVIGO, for instance, the TTO do not manage R&D contracts but only patent and spin-offs activities. At USC it happens the opposite, as the TTO is not in charge of these two last activities that are under the umbrella of other organism. Finally, at UDC –after a long period where the TTO owned very limited functions- they have decided to centralize all activity at this office.

Another important aspect refers to the importance of public funding to support university-industry collaboration, particularly (but not only) from the regional administration. Regional programmes have been important for instance to build service infrastructure supporting spin-offs and entrepreneurship activities at universities. At the same time, general programmes of R&D and innovation usually encourage collaboration. Nevertheless, according to some of the persons interviewed, the high importance of public support could have had a certain negative effect as it created too much dependence on public funds for the promotion of university-industry collaboration. This would explain the strong reduction of collaborative activities once the crisis burst in 2008. Regarding the relationship with the industrial structure of the region, we have generally observed that its weight on the nature and profile of collaborations is not very relevant. This might be related to the low-tech and traditional profile of most sectors in which the Galician economy is specialized. Nevertheless, a certain structural disconnection between university offer and industrial demand might also exist. Thus, only the food industry, where specific structures like technological centres have been established during last years, shows an increasing but still modest collaborative propensity. In general we can observe that collaboration is too much biased by university scientific and departmental specialization and too little by local and regional industrial specialization. Finally, we asked as well about what university might offer to industry and vice versa. Universities provide a knowledge basis for long term challenges to firms and industries, which are usually more affected by short term problems. Besides, universities are many times a good, highly sophisticated and quite cheap source to solve all kind of technical and production issues. On the other hand, firms might offer to universities a field to test research results as well as an excellent connection to the "real world", i.e. an opportunity to know the problems of the surrounding productive system and an opportunity to adapt less bureaucratic organization structures.

Table 4. Strengths and weaknesses in the relationships between university-industryin Galicia

Strengths	Weaknesses
Existence of a consolidated and general legal framework that allows university-industry collaboration	Too much dependence on public funds for the promotion of university-industry collaboration
Existence of a regional government with significant competences on innovation policies that has generally supported university-industry collaboration	Remaining of some loose ends at legal frameworks regulating university-industry collaboration
Progressive overcoming of distrusts among companies and university personnel	Lack of a unique and centralized body at universities to manage collaborations with companies
Pioneer initiatives at USC like the establishment of Spin-off incubators and a venture capital firm	Lack of specific normative regulating university-industry collaboration (only at the USC case)
Progressive incorporation of some traditional sectors, with strong presence in the region, to collaboration dynamics (e.g. food industry)	Collaboration too much biased by university specialization and too little by regional industrial specialization
What University offer to industry	*What Industry offers to Universities*
Knowledge basis for confronting long term challenges	A view of the real problems of the productive system
High level S&T solutions at a reasonable cost	A field for testing research results
	A less bureaucratic organizational structure (to which adapt)

Source: Own elaboration.

University–industry collaboration and the institutional framework in Apulia

The Apulia university system is formed by five universities. The oldest is the University of Bari that was created in 1924 and the University of Lecce, recognized as public university in 1967-68. In the early '90s Polytechnic University was born from a separation of the University of Bari and in 1999 the University of Foggia. Finally, in 1995 the free Apulia Mediterranean University "Jean Monnet" in Casamassima which is not a public University although is legally recognized. Since 1998, in accordance with the Presidential Decree n.25, these five universities have gradually become part of the University Committee for the Coordination of Apulia Region (CURC). Nowadays, the University of Bari is the most significant university, both on size side and in

terms of number of Faculties and students as well as regarding the number of departments.

About the main research areas, there is some overlapping particularly in the field of social sciences and humanities. Generally, the Uniba shows a strong specialization on health science, chemistry and physics and also on other classical disciplines such as law, economics, philosophy, languages, biology. The Unisalento and Polytechnic mostly focus on mechanics and electronic engineering as well technology; in addition, Unisalento focuses on art sciences and culture; the Unifg is specialized in agricultural sciences and health sciences. Finally, we didn't include LUM (the private university) as it is formed by research staff mostly from other universities. The following scheme shows the hard sciences research areas by universities.

Table 5. Apulia region Universities (2012)

	Students/Scientific Staff	Departments	Hard Sciences Research Areas
Uniba	56.305/1540	24	Biotechnology/Life Science Chemistry/Physics New Materials Computer Science and ICT Pharmacology Cultural Heritage Food and Vegetable Genetics Health Technologies Maritime Zoology -Veterinary Medicine Applied Physics
Unisalento (Lecce)	19.426/664	8	Cultural Heritage Maintenance Materials Hearth Science Mechatronics Nanotechnologies Avionics/Aerospace Eng.
Polytechnic of Bari	12.639/299	4	Automotive Mechanics/Mechatronics Hearth and Water Science Computer Science and ICT Transport Engineering
Unifg	10.839/359	6	Agro-Industry Food Control Techniques Alternative Energy Breeding Science and Technology

Source: Own-elaboration.

For a long time Italian university system was characterized by a low autonomy level because the central government played a significant decision-making power in the allocation of financial resources to universities (Baldini,

2006). According to this trend, the first important financing experience in research field involving universities as well as firms in the framework of extra-ordinary plan for "Mezzogiorno" development permitted to establish in Bari one of the first Italian scientific and technological park (TECNOPOLIS) dated as from the early '80s and arranged by universities, public institutions, companies and banks. However, the first concrete regulatory example on R&D at national level is represented by law n. 46 of 1982 aimed to introduce new tools for supporting technological development and human resources training in research sector. Before this law, the decree n.382 regarding University Reform of 1980 gave Italian university a wide financial autonomy in order to promote, inter alia, additional research networking and public as well as private funds.

The Decree n. 297 of 1999 authorised universities to issue regulations and Iacobucci, Iacopini, Micozzi and Orsini (2011) refer that since then let researchers and professors to participate in the capital and management of newly established companies aimed at the industrial use of research (p. 9) and academic staff to be involved in the ownership and management of new initiatives (O'Shea, Chugh and Allen, 2007). These regulatory changes reached good results: Italian universities recorded 17 patents in 1995, 35 in 1997 and 121 in 2001. This act also highlighted the capacity to set up specific offices within the universities like the so called Transfer Technology Offices.

In Italy, the first TTOs were set up just since the 90s, but only between 2001 and 2008 the most of the universities created devoted units, with a boom during the period 2004-2006, because TTOs took advantage of specific government funds. Ultimately, the connected activities to the technology transfer are a fairly recent phenomenon for Italian university and in several cases different structures inside universities (such as patent and research offices) were aggregated into a unique office in order to increase productivity and efficiency. Nowadays, almost all universities and public research institutions have formalized specific TTOs.

Regarding entrepreneurship, although the first regulatory act was the above mentioned Decree, it does not well define the meaning of "spin-off". This decree identifies people eligible for incentives and activities to be specifically considered. The beneficiaries are newly established companies, based on equity participation or, at least, on the commitment of all or some of the university professors and researchers, PhD students, research fellows.

Through the Decree n. 593 of 2004, authorization procedures and intellectual property rights were well defined and each university started to govern the matter autonomously. As we said, thanks to a Decree of 2010 the national government fixed the goal of harmonizing the Italian legal system to European and international standards, but it was ignored so that

public research lost the likelihood to restore a rule, potentially able to get the ownership of patents by the university and to leave to the researcher the opportunity to be recognized as author and to get royalties. Because of the budget constrain and the growing cuts involved the research funds, universities were encouraged to collaborate with industry.

The Apulia Region planned for the first time an organic programme for technological innovation within the Operational Program of European Regional Policy 1994-99. The connected actions provided technical assistance to SMEs, useful for the development of technological transfer in research sector, high level training for human capital and linkages among existing structures. The goals of regional innovation plan were FAR (Fund of subsiding research) and FIT (Fund for technological innovation) whose general goal was to sustain the R&D activities, and specific goals to create joint ventures among companies and between those and universities and other research institutions.

Thanks to the new regulations frame by Apulia Region and EU Regional Policy, specific policies for technological innovation were better defined: the Operative Program for 2000-2006 designed infrastructures for scientific and technological innovation and promoted new tools able to create linkages among firms by paying great attention to sectors potentially able to contribute to the research and technological development. Specifically focused on the technology transfer were the Technological Competence Centres, whose main goal is the involvement of SMEs within strategic fields in terms of innovation and technology application (transports, environment, biotechnology, food and ICT). The TCCs were supported by National Operative Programme 2000-2006 on the base of a call cared by Ministry of University and Research. They involved universities, public and private research organizations as well as firms coming from Nuts II Italian Regions (Apulia, Basilicata, Calabria, Campania, Sardinia and Sicily). These tools contributed to improve the pre-existing situation, even if didn't greatly change the ability of regional system to create and absorb technological innovation. However, the regional strategy carefully preserved both regional industrial policy and a competitive strategy within the international specialization and technology transfer frame , so that in few industrial branches some regional companies became leader in the world.

Although the R&D supply is mostly based on the university system, other public research centres like National Research Council (CNR), National Body for Alternative Energy (ENEA), National Institute of Nuclear Physics (INFN) and more than forty research labs was recognized by Ministry of University and Research as well as several research consortia like Centre Planning, Design and Technology of Materials (CETMA), National Consortium of Research for Optoelectronic Technologies (OPTEL), Euro-Mediterranean Biomedical

Scientific Institute (ISBEM) and Laser Centre that, albeit private subjects, have a majority public participation.

The regional law n. 23 of 2007 introduced Technological Districts, that involve companies and local institutions as well as universities and connected research centres in order to develop a common strategic plan. After the establishment of productive cluster in traditional manufacturing (textile, clothing and leather, sofa, etc.), since 2009 the regional R&I strategy defined a list of economic activities characterized by higher technological contents; then, aero-space, food, cultural heritage, biotechnology and life science, energy and environment, logistics and production technology, mechanics and mechatronics, new materials and nanotechnology, information and communication technology districts started to be implemented and nowadays represent a very interesting productive and technological "network of networks". Then, technological districts are one of the main outcomes arising from the cooperation between central government and regions and a strong tool to empower the regional planning within selected innovative and technological fields and the collaboration among other local institutions, companies, universities and research centres. This mentioned strategy is financially supported by the ERDS, ESF and National Funds.

Even we can meet a regional innovation and research strategy in Apulia region, nevertheless the ongoing reorganization does not seem to have realized long term investments for human resources training; consequently, this affected the innovation path started at the top level of the regional administration system.

The regional production system and specialization of Apulia region

Apulia is characterized by small and micro firms and only 0.35% of total has more than 50 employees. Most of these firms are concentrated in low-tech sectors (textile, clothing, footwear, wood and furniture, food) and characterized by networks with subcontractors in several stages of production. Marketing, research and innovation activities are carried out by final firms, often localized outside the region. Several firms are located in some territorial production systems: textile industry in the north of Bari, clothing and footwear in the lower Salento as well as in Itria valley and in the north of Bari; sofa district in Sant'eramo, Gravina and Altamura (all localized on the western border of the region). Opposite, the agri-food system appears to be more widespread albeit with a higher concentration in Bari and Foggia; the steel industry is sited in Taranto, mechanics in Bari, chemicals and pharmaceuticals in Brindisi and Bari, aeronautic and aerospace sector embedded in Brindisi, Foggia and Taranto for the energy sector, aviation and software. In Apulia are located

global industrial groups such as IBM, Bosch, Edison, ENI, Alenia, Avio, Agusta, FIAT, Aventis, etc.. Own elaborations from Italian Institute of Statistics dataset (ISTAT, 2010) show a more detailed frame in terms of relative specialization index. The figure shows the economic activities with a specialization rate > 1. Results confirm that the most specialized sectors are those included in traditional manufacturing like agriculture, food industry, textile, clothing, wood, which refer a specialization rates 1.5≤SI≤3.7. Then, we have those sectors characterized by a medium specialization level like metallurgy, iron metallurgy, manufacture of motor vehicles, construction, etc.. Although belonging to the tertiary, research and scientific development sector still looks not much specialized showing a specialization rate slightly higher than 0.5. Finally, no high-tech economic activities show a specialization index higher than 0.5.

Figure 2. Relative sectoral specialization in Apulia, in relation to Italy (2010)
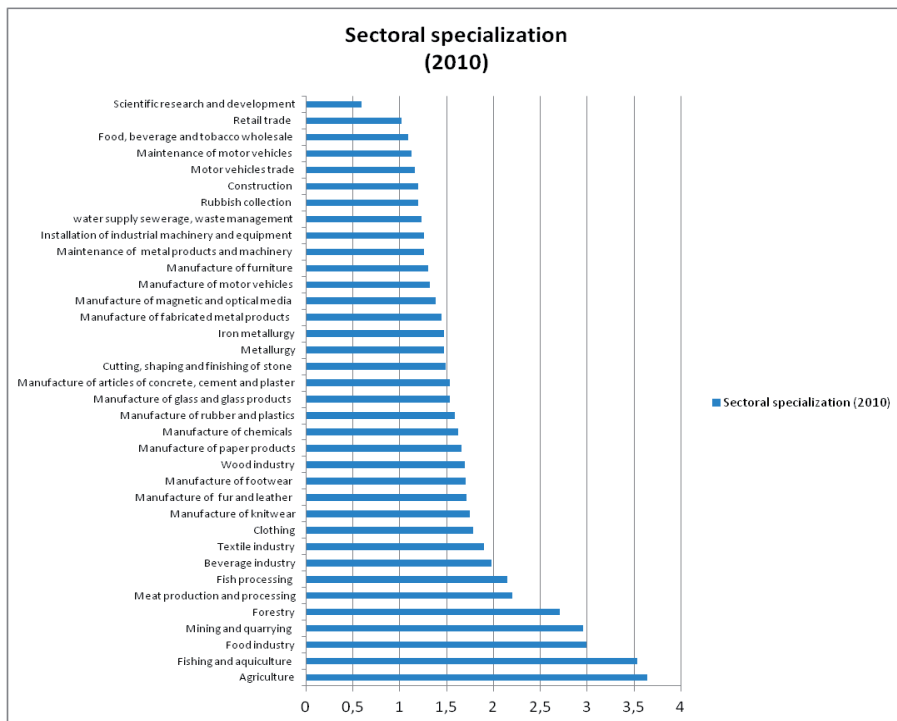
Source: Own elaboration on ISTAT (2010).

When we focus on total investments in scientific research by industry, public and private institutions and universities, the total expenditure is lower than the national and EU average. The gap between regional and national

expenditure is significant even considering only the R&D expenditure made by firms. The share of firms expenditure in R&D on total regional GDP is 0.18%, while in Italy is 0.68% and in Europe is 1.24; overall, although the Italian share in R&D on GDP in 2010 is rather low (1.26%), in Apulia is still lower than the national average (0.71%)[6]. It means that, despite the presence of selected advanced sectors, Apulia is indeed characterized by low investments in research and innovation. Anyway, both in the starting of leader companies and in the territorial new form of organization of high-tech firms, universities played an important role, being a pillar of knowledge infrastructure system in Apulia too.

Table 6. Main innovation indicators of Apulia and EU-27

	Apulia	EU-27
Population (2013)	4.050.803	501.403.599
GDPpc (PPS) (2011)	16.100 €	24.600 €
Unemployment Rate (2012)	15,6	10,4
R&D Exp/GDP (2011)	0,71	2,01
Business R&D Exp/GDP (2011)	0,18	1,24
Patent Applications to EPO per million inh (Average 2006-2010)	13,38	111,56
High-Tech Sectors (% Total Employment) (2011)*	6,2	10

* High-Tech Manufacturing + High-Tech Knowledge intensive services
 Source: Eurostat.

University-industry interaction in Apulia Region: recent evidence

In the last few years, Apulian universities are making great efforts to promote technology transfer, although operating within an organizational, financial and legal context not so much developed yet and often changing. Focusing on the case of the University of Bari, TTO is currently made up of two structured units staff: an area manager who is also in charge of the Sector i (Spin-offs sector and productive districts) and a vicar in charge of Sector II (Patents protection and intellectual property).   Conversely, the TTO of Politechnic of Bari is characterized by a single sector composed by five units staff including the area manager.

The following table shows some relevant outcomes reached by regional universities and institutions as detected by NETVAL annual report. More specifically, our elaborations, related to the most recent survey of 2012 (NETVAL, 2014), compare some remarkable elements between Apulia and Italian case. We use the most recent data related to a single year as it provides less fragmented information and more specific details.

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6   Source: Eurostat and Italian Institute of Statistics (ISTAT, 2010).

Among five regional universities, only four provided data useful to compare them with the national sample. The table displays a lower average value in terms of annual budget compared to the national sample. Anyway, the survey observes a regional value not so low, as it is positioned on the extreme of its range (195,3 Millions euro). In fact, only 14 universities are within the range of >100-≤200 (Meuro) and 22 within >200->500, among 53 answering universities out of 61 belonging to the sample. Data also show very low average values either in terms of doctoral students or contractors (384.3 vs 512.7; 133.3 vs 328.1). With regards to scientific and technological research funds, regional average value is quite low compared to the correspondent national value (29 million). If we consider the "top 5" universities, which indicate a higher level of research funds (approximately 121 MEuro/university), there is an overall increase compared to 2011.

About inventions, active patents and licensing data show always lower average values compared to the national ones.

Spin offs by public research, although characterized by lower average values compared to the nationals, are growing in absolute terms. More specifically, Tuscany is the region hosting the highest number of spin offs (10.7%), followed by Lombardy (10.6%), Emilia Romagna (10.2%) and Piedmont (9.6%); Apulia recorded 8.3% (corresponding about to 81 spin offs). Apulia is characterized by a younger profile than other regions as regarding spin offs average life (about 3.4 years). Out of Italian 20 regions, Apulia is at the fourteen place of the ranking even if is the first between the seven regions belonging to the "Mezzogiorno".

Table 7. Some characteristics of universities at regional and national level (2012)

	Total Apulia	Average Apulia	Total Italy	Average Italy
Inizio modulo				
Total annual budget of the univ / institution (M €) Fine modulo	781,1	195,3	12,027,4	226,9
Doctoral students	1.537	384,3	27.174,0	512,7
Contractors	533	133,3	17.063,1	328,1
Total research funds	40,8	10,2	1.496,4	28,8
Inventions	10	2,5	399 (n=51)	7,8
Pantents licensing	12	3,0	201 (n=52)	3,9
Active patents	116	29,0	3.356 (n=49)	68,4
Spin offs (Year 2012)	10	4,0		
Spin offs (Total number)	81	20,25		

Source: Own elaboration based on NETVAL survey (2014).

Strengths and weaknesses of university-industry collaboration in Apulia: a qualitative view

Although TTOs are trying to strengthen the promotion of the interdependencies between university and industry, academic members are organized in departments involving broader academic areas that make difficult for industry to identify expertises in the scientific field or for facing with a specific problem. Thus, the role of the technology transfer offices shouldn't differ from the typical function regarding information; in fact, information function by the universities' R&D services are information professional services. Their main common goal is to lower the entrance barrier for the external business world and to complement existing informal direct contacts between university and industrial world.

Generally, the above mentioned offices have two macro-functions: first, referred to a supporting function for the assessment of projects outcomes, that are aimed at their protection, and economic development implementing patents database and spin offs; this function represents more specifically the technical and operational aspects well known by academic world. Secondly, we refer to an information function dissemination of university's research strengths and the organizations visits to university labs for highlighting university capabilities and facilitating personal contacts between university, industry and society. So, technology transfer office should able to launch special initiatives that lead university closer to industrial world, thanks to effective opportunities of meeting among scientists and industrial workers on specific and common topics of interest. Indeed, many firms still view university as a structure focused on basic research and teaching, unable to develop an attitude in practical matters such as applied research and projects as well.

In addition, these offices should play a role more complex than simple information services: it is sometimes hard to persuade university professors that spreading their expertise is wise and needful; conversely, some academic members suppose that their research experience is enough to play an information role.

Unfortunately, the TTOs are not well-known by university community. Opposite, spreading the TTOs' mission would create a more attractive image both for the office and the university, thanks to the awareness of services that may be provided to the potential customers, included students' placement. So, the TTOs must be able to mediate different and -several times- opposite individual as well as collective expectations.

Among the strengths that characterize university-industry networking in Apulia, firstly we have to highlight the regional knowledge and research infrastructure, that counts on 4 public universities (+ a private one), the local

office of the main national research institute as mentioned above, and 49 public and private labs acknowledged by Italian Ministry of University and Research, out of the internal labs of the biggest company. Then, Apulia is not at the start-up step of the research-innovation-technology transfer chain (RITECH); rather, it is in a fording position where it is hard to come back as well as to go on, considered that the so called "RITECH" process cannot be tackled trough a "stop and go" strategy.

The second strong point of Apulia ritech system is the involvement of multinational groups (Agusta-Westland, Alenia, Aventis, Avio Aero, Bendix Altekna, Bosh, Edison, Eni, Getrag, Ibm, Ilva, etc.) and, in the same time, of local companies, some of them ranked at the top level in their own branch (Cle, Imp, Insoft, Itel Telecomunicazioni, Mermec, Masmec, Sincon, etc.)

The third condition that can be considered as a strength point is the strategy adopted by regional government in order to support university-industry collaboration thanks to EU and national funds. As referred above, Apulia Region answered to the most of calls and initiatives promoted at over-national as well as domestic level, acting in the framework of the institutional planning activity (POP 1994-2000; PO 2000-2006; PO 2007-2013), whose outcomes and perspectives are up to dated within the Smart Specialization Strategy 2020 of Apulia Region. This document demonstrates the importance of a governance authority for planning and managing the regional innovation strategy. In Apulia, the regional government is supported by three operative agencies (ARTI, InnovaPuglia, PugliaSviluppo), that complete the panel of the main actors of the industrial policy at Apulia regional level (university, firms, regional government). As industrial policy we mean the body of public activities involving actors, rules and other stakeholders, able to create the conditions for structural economic changes more intensive than the spontaneous transformation that we can get without the same policy (Bianchi and Labory, 2011; Warwick, 2013; Viesti, 2013).

Finally, we can include within the strengths list some other pro-active conditions, such as:
• Young unemployed people having a high education degree (Dileo, Garcìa Pereiro, Losurdo, 2013);
• Hi-tech districts of production acting within hi-tech branches;
• Qualified services system;
• Increasing demand for added value services.

Among the weaknesses, first of all we remark a basic point: a lot of barriers against the university-industry cooperation still remain. The most important of these are the long-term orientation of university as well as the lack of suitable government programme in the long term specific research areas. One more weak point is the low profile of TTOs and Regional Industrial

Liaison Office (ILO), generally due to the lean ability of their staff in managing technology transfer. At least they need a person who is well-known inside the university and has a large personal network of contacts with industry not only at regional but also at international level managing the liaison office. The operational tasks of the TTOs are not optimal for several reasons largely due to the lack of a staff having specific knowledge of the entrepreneurial world as well as devoted research units able to manage the bridging with the industrial sector.

A weakness can be considered the presence of public bodies that should play a role of assistance and technical support to regional governmental authority as well as consulting service to the networks and other operators engaged in the technology transfer. Indeed, sometimes they play a sort of duplication of university-industry networks. We are referring to the role played by some public equivalent bodies, such as InnovaPuglia and PugliaSviluppo that mostly practice a kind of intermediation whose consequence is the crowding out of the devoted organizations like Competence Centres, TTOs, that are the main expression of university-industry cooperation, and the "nodes" of public research centres (i.e. a new form of networking actually in progress thanks to PO-ERDF 2007-2013).

This not necessary duplication adopted by regional agencies contributes to form an additional weakness that is the lean support given by public procurement in order to empower the rithec process and encourage university and industry cooperation to set-up induced projects and promote new firms and goods, new specialization able to integrate the existing ones and to revaluate "traditional" branches of production adopting new materials and process.

Connected to this last weakness is the slow trend of technological upgrading of public bodies, that is a really weak point in terms of technological enhancement of the system and of cooperation university-industry in order to create new firms and additional employment opportunities. Finally, a not organized and well addressed public demand loses the occasion to realize a mix between direct financial subsides and indirect supports, that should be the long term perspective of the integrated system of networking, that Apulia regional government is trying to create by joining research organizations and firms.

Universities would offer to entrepreneurial world their research ability cumulated over time, continuity in accessing to consultants and patent rights, new business opportunities as well new highly skilled graduates potentially able to create new ideas and improving the performance of firms. In addition, the industrial world might offer to universities a more practical approach and technical methods as well as enriching teaching programs through devoted

stages useful for job placement and implementing new model of decision making.

Finally, although the utility is not clearly perceived, especially in the short term, the impact of a triple connection TTO-University-Firm would stimulate the productivity through the mutual and stable interaction between different agents involved in this process. In this case, the interest of researchers and professors in the collaboration between university and industry is potentially higher. In fact, the simultaneous connection between the marketing capabilities of TTOs, scientific competence of the academic staff as well as the entrepreneurial vision would provide faster updates on the development dynamics both at local and regional level. The outcomes arising by this relation could be converted into higher publications level, more participation in international conferences and international scientific agreements.

Table 8. Strengths and weaknesses in the relationships between university-industry in Apulia region

Strengths	*Weaknesses*
Presence of a wide regional knowledge infrastructure	High polarization among traditional industry and hi-tech branches
Availability of a regional strategy for scientific research	Low propensity to R&D investment expenditure
Reference multinational groups and SMEs leader players	Lean demand for innovation and modest role of public procurement
Increasing demand for added value services	Duplication of roles and functions within tech transferring system
Districts of production acting within hi-tech branches	Moderate rate of young people with medium-high level education
Young unemployed people having a high education degree	Low profile of public agents working in research field
What University offer to industry	*What Industry offers to Universities*
Own research capacity	Access engineering, technical development, manufacturing
Continuity in accessing to consultants and patent rights	Enriching teaching programs through devoted stages
New ideas and business opportunities	Placement and job opportunities
Recruitment of graduates	New model of decision making

Source: Own elaboration.

Conclusion

In general terms we can affirm that a progressive transition from a mode-1 to a mode-2 system has occurred at the relational framework affecting universities and industry both in Apulia and Galicia. This has affected both

the formal (legal) and informal (behaviours) frameworks. Thus, we have seen that although normative and legal changes have first occurred in Galicia and as a consequence universities own TTOs since early 90s, in Apulia these changes have also happened some years later. Moreover, TTOs are organized –generally speaking- in a very similar way at both regions, performing very similar functions.

In both regions, public support –particularly from the regional level- has been a key instrument to promote the interaction of university-industry collaboration. Different programmes, like the one supporting technological-productive districts in Apulia or the R&D plans in Galicia, have encouraged the joint participation in R&D projects of business and universities research bodies. The effort of Apulia decision maker to create a critical mass of research-innovation-technology system is producing appreciable outcomes in terms of changes affecting university-industry relationship. Public support could nevertheless have created certain dependence on public funds dependence as shown in the Galician case with the strong reduction of R&D contracts between universities and industry due to the cut of public funds in the crisis period.

Moreover, in both cases certain barriers coming from the different cultures and institutional behaviours remain. Long term university views contrast with short-term and concrete needs of industry. This might be related to a still short tradition in cooperation since, as noted in the Galician case, beginning a collaborative experience even when the R&D content is low, makes a difference for the future development. In any case a certain culture that gives little value to transfer activities at universities -in Spain- or visions centred on sectoral instead of interdependent approaches -in Italy- (Losurdo and Dileo, 2014), are still performing as obstacles. Time is needed to consolidate cultural and behavioural changes at both university and industries.

Other barriers refer to normative aspects which still remain uncertain, like the possibility to make compatible entrepreneurship and academic activities in Galicia, or the legal framework affecting patent and authorship in Italy.

Regarding the productive specialization, from the Italian case we have learnt that the low propensity of industry to invest in R&D and innovation activities, is a major barrier for collaboration with universities. This is particularly relevant when dealing with traditional industry and the Apulia case shows strong differences between this industry and hi-tech branches, when dealing with collaboration activities. This evidence reinforces the results found by Isaksen and Karlsen (2010) for the Norwegian case, where STI dominated industries were more prone to cooperate with universities than

DUI industries. In relation with this, in the Galician case we have observed that collaboration is somehow too much biased by the university scientific and departmental specialization and too little by industrial specialization. This might be related to the low-tech profile of regional industry but probably an adjustment of the university offer in terms of research and academy is also needed. Actually, some traditional activities, like the food industry in the Galician case, have progressively been involved in collaboration action with universities.

Further research on university-industry collaboration, based on the Apulia region and Galicia case, will try to observe how this interaction enters into and shapes the innovation system of each region. At the same time, although a large-scale research will be needed, it will be very interesting to analyze in depth the impact of university-industry collaboration in the development of these two less-favoured European regions.

Finally, according to other experiences, it will be interesting to test in Galicia and Apulia the effect of firm´s size into the likelihood of intensifying the cooperation with university as well as whether or not the presence of employees with higher university degree may improve the absorptive capacity of enterprises. It will be also interesting to investigate whether the difference between STI and DUI industry modes of innovation stand in our case or not to explain collaboration between university and industry.

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Abstrakt (in Polish)

Uniwersytety pełnią rolę jednego z kluczowych podmiotów w ramach narodowych i regionalnych systemów innowacji. Charakter współpracy między uniwersytetami i przedsiębiorstwami zmienił się ciągu ostatnich kilkudziesięciu lat, przy czy wykazuje on znaczną różnorodność w poszczególnych krajach i regionach. Interakcję między tymi podmiotami determinuje szereg czynników, począwszy od branżowej struktury terytorium, aż po uwarunkowania instytucjonalne i prawne. Celem artykułu jest poszerzenie rozumienia tego procesu, na podstawie porównania dwóch europejskich regionów (nuts-2) - włoskiej Apulii i hiszpańskiej Galicji. Rezultaty badań wskazują, że w obu regionach nastąpił rozwój od rozproszonego do zintegrowanego podejścia w relacjach między nauką i gospodarką. Istotną rolę w rozwoju współpracy między

środowiskiem naukowym i przedsiębiorstwami w Galicji i Apulii odegrała polityka gospodarcza, szczególnie na poziomie regionalnym.

Jednocześnie jednak ciągle występują kulturowe i instytucjonalne bariery, zarówno po stronie środowiska akademickiego, jak i biznesowego, które utrudniają właściwe ukierunkowanie i większą efektywność współpracy. Ograniczeniem jest z jednej strony niski poziom kultury innowacyjnej obserwowany w tradycyjnych branżach, które dominują w obu regionach. z drugiej zaś strony, istnieje także potrzeba lepszego dostosowania badań prowadzonych przez uniwersytety, gdyż są one bardziej uzależnione od naukowej i funkcjonalnej specjalizacji uczelni niż lokalnej i regionalnej specjalizacji przemysłu.

Słowa klucze: *uniwersytet, gospodarka regionalna, współpraca, regiony.*

Biographical Notes

Manuel González López is a PhD lecturer and researcher at the Department of Applied Economics in the University of Santiago de Compostela, Galicia (Spain). He holds a MSc and MPhil in Social Sciences from the University of Manchester (UK) and he has been a visiting researcher at several European universities. His main fields of research are Economics of Innovation, Regional Economics in the European Union and more recently also the industrial and innovation dynamics of the Food Sector. He has published numerous papers in different journals like European Urban and Regional Studis, Environment and Planning C or European Planning Studies. He has also particiapated in several European research projects

Francesco Losurdo is a Professor of Economics at the Department of Political Science, University of Bari (IT), General Secretary of Community of Mediterranean Universities, President of Daisy-net Competence Centre. He was Visiting Professor at the Universidad Argentina de la Impresa, Universidad de Conceptiòn del Uruguay. He also was Visiting Professor at the University of Szczecin (PL), University of Warmia and Masuria at Olsztyn (PL) and University of Hankuk at Seoul. His research interests have focused on industrial policy, regional policy and planning and assessment of European programmes.

Ivano Dileo received his PhD in Demography and Economics at the University of Bari 'Aldo Moro' focusing on industrial agglomeration of economic activities. He was a visiting PhD student at the University of Sheffield (UK) and Visiting Researcher at the University of Santiago de Compostela (SP). His research interests have mostly focused on industry, innovation and regional development.

The importance of locally embedded personal relationships for SME internationalisation processes – from opportunity recognition to company growth

Milena Ratajczak-Mrozek[1]

Abstract

The purpose of the paper is to present the importance of locally embedded personal relationships and individuals' networks for the rise of small and medium enterprises (SMEs)' opportunities in the internationalisation process (especially the market entry phase) as well as resulting their international operations and growth. Above all, the aim of the article is to answer the question what is influencing the actual impact of these resulting opportunities on internationalisation and growth.

This paper adopts both a conceptual and empirical approach to the problem based upon a critical review of pertinent literature. Two case studies of companies from industries representing different levels of technological advancement, that is the furniture industry and IT industry, are presented.

The theoretical and empirical analysis presented in the article points to the fact that relationships simultaneously facilitate opportunity recognition and themselves constitute such an opportunity. The analysis carried out as part of the case study proves that main factors determining the rise of the opportunity based on locally embedded personal relationships are trust and mutual understanding, in this way emphasising the importance of relational embeddedness. At the same time the realisation of these opportunities and therefore their impact on the internationalisation process and a company's growth requires additional social factors (an entrepreneurial attitude) as well as economic factors (such as quality and competitive prices).

***Keywords: relationships,** personal relationships, individuals network, local embeddedness, internationalisation, foreign market entry, opportunities, SME*

1   Milena Ratajczak-Mrozek, PhD, Poznań University of Economics, Department of International Marketing, al. Niepodległości 10, 61-875 Poznań, Poland, tel. +48618543312/ fax +48618543610, milena.ratajczak@ue.poznan.pl.

Introduction

Companies' continuing search of new growth possibilities means, in many cases, the necessity to internationalise their activities. Internationalisation is important for companies' development and is related to many positive effects and growth. However, in the case of small and medium enterprises (SMEs) the world is not necessary truly global. These companies lack among other things the resources required for the execution of large orders and the international reputation necessary to acquire foreign customers which altogether create hindrances for their internationalisation and especially for the initial entry on to a foreign market and the beginning of this process. Thus, from companies' development perspective, it is important to answer a question if and how it is possible to overcome these hindrances? And whether, therefore, in the case of SMEs, and especially micro companies traditional approach to planning international activities may be applied (i.e. including formal step-wide planning strategy, foreign market selection input forms, sending offers etc.).

For small and medium companies, an important factor contributing to internationalisation and accompanying growth as well as a solution for the above mentioned hindrances may be the willingness and openness of these SMEs, (their owners and/or managers), to make the most of an opportunity which presents itself. This is related to a more ad hoc internationalisation (ad hoc compared to the outlined strategic approach associated with planning of the next steps of the process). The creation of such international opportunities may be facilitated by personal relationships, analysed in the literature also as individuals' networks or social networks. Their importance is emphasised in the research but mainly international relationships and relationships with foreign customers, intermediaries are underlined. Little attention is paid to the importance of the local origin of these relationships. Meanwhile, the locally embedded relationships with other entities appear also to be important. In this way we may say that the internationalisation process can be explained by the recognition of opportunities that in turn are facilitated by locally embedded personal relationships and the individual's network.

The purpose of the paper is to present the importance of locally embedded personal relationships and individuals' networks for the rise of SMEs' opportunities in the internationalisation process (especially the market entry phase) as well as resulting their international operations and growth. Above all, the aim of the article is to answer the question what is influencing the actual impact of these opportunities on internationalisation and growth. In this way we address the issue of how local and regional factors

impact the company activities and analyse the role of networks in terms of entrepreneurial opportunity seeking and growth.

This paper adopts both a conceptual and empirical approach to the problem based upon a critical review of pertinent literature. The concepts of opportunities, business networks and personal relationships, as well as embeddedness are applied to the analysis of SMEs internationalisation processes and growth. Additionally two case studies of companies from industries representing different levels of technological advancement, that is the furniture industry and IT industry, are also presented.

The paper is divided into six sections. In the first section a literature review concerning SMEs internationalisation, the essence of international opportunity recognition, and the meaning of personal relationships is presented. In the second section the conceptual framework of the research is proposed. The third section concerns the research method adopted within the empirical analysis. Next, in sections four and five the two aforementioned case studies are presented and discussed. Finally conclusions and directions for further research are presented.

Literature review

The specificity of SMEs in terms of internationalisation

Internationalisation means "the process of increasing involvement in international operations" (Welch and Luostarinen, 1988, p. 36) being mainly an activity driven by the desire to penetrate overseas markets (Fletcher and Barrett, 2001). This traditional approach analyses the entry process and then a company's activities on specific foreign markets.

The main positive effects for companies resulting from internationalisation include enhanced revenues, economies of scale and scope, the efficient utilisation of resources and access to cheaper or scarce resources, foreign know-how, market expansion, adaptive flexibility, diversification of activities and benefits of reputation (Contractor, Kundu and Hsu, 2003; Elango and Sethi, 2007; Barcellos, Cyrino, Oliveira Júnior and Fleury, 2010; Manolova, Manev and Gyoshev, 2010). So these positive effects are to a largely extend related to companies' development and growth. Research underlines the positive relationship between internationalisation and a company's performance (Hitt, Hoskisson and Kim, 1997; Gomes and Ramaswamy, 1999; Contractor, 2007; Pangarkar, 2008; Assaf, Josiassen, Ratchford and Barros, 2012). So despite the risks associated with internationalisation (Zaheer, 1995; Barcellos et al., 2010) this process is highly desirable.

The well-established internalisation theories (the three main theories include the Uppsala model, Dunning's eclectic paradigm and the network approach) were focused on large, multinational companies, whereas international entrepreneurship research began as a response to the "rise in the number of firms that were internationalising while still young and small (McDougall and Oviatt, 2000)" (Ellis, 2011, p. 101). Available research confirms that SMEs have a different specificity in terms of internationalisation processes as they must face more hindrances than large companies. First of all, due to limited internal resources they often lack the resources needed to enter foreign markets (e.g. financial resources or the materials needed for the execution of large orders or the lack of reputation) (Jansson and Sandberg, 2008; Meyer and Skak, 2002; Roberts, 1999). Moreover international activities require a larger proportional allocation of resources of an SME than is the case of a large company. In the case of failure of the particular international activities, "the impact on an SME may be greater, which increases the risk levels of SMEs (Buckley, 1999; Lu and Beamish, 2001)" (Pangarkar, 2008, p. 478). The managerial resources of SMEs and the constraints related to them also have to be taken into consideration. This narrow resource base is not limited solely to production technologies but also to organisational activities (Boter, Holmquist, 1996). Due to constraints of management time, smaller firms might "take short-cuts in decision-making and information gathering" (Buckley, 1999), lacking the information necessary for exploiting any international opportunities (Buckley, 1999, Qian, 2002), managerial expertise and competence (Karagozoglu and Lindell, 1998), comprehensive market research and expert knowledge (Musteen and Datta, 2006).

Opportunity recognition in SMEs internationalisation processes

Because of the specificity of the functioning of SMEs and the related hindrances and characteristics of their internationalisation process, the approach to internationalisation typical for large companies (i.e. strategic planning, implementation of the next steps) does not necessarily apply. Thus, to overcome the outlined hindrances an important aspect in the SMEs internationalisation process might be seen in the recognition of international opportunities (or international entrepreneurial opportunity recognition) (Chandra, Styles and Wilkinson, 2009).

Within entrepreneurship research, studies of opportunity recognition have been conducted mainly in a domestic (not international) context (Shane, 2000; Arenius and de Clercq, 2005; Ardichvili, Cardozo and Ray, 2003; Eckhardt and Shane, 2003; Ozgen and Baron, 2007). In turn, in the internationalisation research, traditional theories of the internationalisation process (that is

the Uppsala model, the eclectic paradigm and the network approach) accept the importance of the perception of foreign business opportunities. However, they do not explain and directly address the phenomenon of opportunity recognition and do not explain how these opportunities come to be identified and exploited (Chandra et al., 2009, Ellis, 2011). At the same time a company's internationalisation process may be seen as opportunity driven (Zahra, Korri and Yu, 2005, Johansson and Vahlne, 2009, Ellis 2011). The recognition of an international opportunity is an important element in understanding the internationalisation behaviour of companies (Chandra et al., 2009; Ellis, 2011; Johanson and Vahlne, 2009; Oviatt and McDougall, 2005; Zahra et al., 2005) as opportunities are "the most important element of the body of knowledge that drives the process" (Johansson and Vahlne, 2009, p. 1424). The acceptance of this fact has resulted in the growth in the number of studies in this regard (Chandra et al., 2009; Ellis, 2011; Johanson and Vahlne, 2009; Zahra et al., 2005; Kontinen and Ojala, 2011).

Research in to opportunity recognition (mainly domestic opportunity recognition) points to two possibilities: opportunity discovery and creation. Opportunity discovery, suggests that opportunities in the market are simply being recognised (Kirzner, 1997 Kaish and Gilad, 1991). Opportunity creation assumes that the opportunity is created, through a deliberate and systematic search and is realised by one of the companies (Schumpeter, 1934; Herron and Sapienza, 1992). We may agree with the authors who underline that in reality opportunity development includes elements of both discovery and creation (Ardichvili et al., 2003; Johansson and Vahlne, 2009; Chandra et al., 2009). It means that opportunity should not be equated with luck, although it may appear to be luck. Pure luck is "where the finder has done nothing to generate the outcome" (Kirzner, 1997, p. 121). In the internationalisation research it is said that the cases of accidental exporters (Styles and Harcourt, 2001) and "unplanned" internationalisation (Crick and Spence, 2005), are not the examples of luck but "they are examples of the role played by social networks combined with firm competencies and motivations that drive the discovery of international market opportunities" (Chandra et al., 2009, p. 38). For this reason an important area of current research regarding the recognition of international opportunity is the analysis of the reasons that make some companies rather than others first recognise and then exploit opportunities (Acedo and Jones, 2007; Chandra et al., 2009; Ellis, 2011). There are three main drivers of the opportunity recognition process identified in the literature, these are: prior knowledge, international network of contacts and a company's entrepreneurial orientation (meaning autonomy, innovativeness, risk taking, proactiveness and competitive aggressiveness) (Chandra et al., 2009) called also relevant skills and alertness (Kirzner, 1979). Attention is also

drawn to the fact that "The recognition of exchange opportunities is a highly subjective process, shaped by entrepreneurs' existing ties with others." (Ellis, 2011, p. 99). That is the reason why personal relationships may be considered as an important trigger of internationalisation.

Personal relationships in the internationalisation processes and opportunity recognition

Business networks, network relationships and ties between individuals (especially managers or entrepreneurs) are seen as an important resource facilitating internationalisation, especially among SMEs (Crick and Spence, 2005; Hadjikhani, Ghauri and Johanson, 2005; Ellis, 2011; Kontinen and Ojala, 2011).

Interpersonal relationships, also known as individual networks or social networks are known to bring benefits within the internationalisation process in the form of reducing transaction and information-acquisition costs (Peng, Lee and Wang, 2005) (Rutashobya and Jaensson, 2004), risk (Sharma and Blomstermo, 2003) as well as uncertainty (Zain and Ng, 2006) during foreign market entry. They also provide knowledge of new markets (Harris and Wheeler, 2005) and help to develop resources and capabilities needed for internationalisation (Zhu, Hitt and Tihanyi, 2006; Manolova et al., 2010; Chandra et al., 2009). Research suggests that personal relationships offer access to network of relationships in other countries, which can then present the basis of new inter-firm links (Harris and Wheeler, 2005). In this way, personal relationships represent between-firm relationship resources that are fundamental in internationalisation (Ellis, 2011; Harris and Wheeler, 2005).

Personal relationships facilitate the identification of new market opportunities (Manolova et al., 2010; Ellis, 2011; Kontinen and Ojala, 2011; Harris and Wheeler, 2005, Chandra et al., 2009; Crick and Spence, 2005; Komulainen, Mainela and Tahtinen, 2006; Sharma and Blomstermo, 2003). However, most of the literature focuses on the role of international, or cross-border networks and personal relationships. Very few studies focus on relationships within domestic markets and their positive impact on the recognition of international opportunities (exceptions include Manolova et al. (2010)). Meanwhile it may be assumed that locally embedded relationships can be also a source of the aforementioned benefits). Locally embedded relationships mean not only that they originate from local, domestic setting but also that they are based on trust and shared routines. Embeddedness, as a concept rooted in sociology, is the idea that firms are connected by networks of personal relations and economic behaviour is embedded in networks of

interpersonal relations (Granovetter, 1985, Uzzi, 1996). In our study we refer to the breakdown into structural ad relational embeddedness (Granovetter, 1992; Moran, 2005) – "a distinction essentially between the configuration of one's network and the quality of those relationships" (Moran, 2005, p. 1131). We take the view that when defining locally embedded relationships their quality (that is trust and shared norms) is even more important that their structure. In terms of opportunities recognised on local markets, embeddness in a social structure is said to create opportunity and improve performance. "Embedding enables the entrepreneurs to use the specifics of the environment. Thus, both recognition and realisation of opportunity are conditioned by the entrepreneurs' role in the social structure" (Jack and Andersson, 2002, p. 467). It is underlined that this is even more important given that SMEs are embedded in domestic business environments to a greater extent than large multinational enterprises (Meyer and Skak, 2002). However it is important to analyse the significance of the local embeddedness for the international activities.

Research framework

Based on a conducted literature review a research framework was developed that constitutes the starting point for the following case studies analysis (see Figure 1).

Figure 1. The process of transferring personal relationships in to SMEs internationalisation and growth – research framework
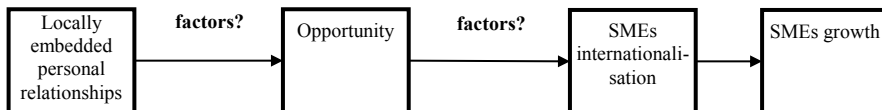
Source: Author's research.

It is assumed that locally embedded relationships (established with different types of entities) contribute to the emergence of opportunity and then to the SMEs' internationalisation and their growth.

In this article we focus on the company's entry to the foreign market. Hence, the direct impact of personal relationships on company's growth (different then related to internationalisation) nor the impact of these relationships on company's international activities after entering the foreign market are not tested. These assumptions are conditioned by the necessity to put the analysis at a specific moment of time.

The two important questions that are analysed are:

-   what are the main factors determining the rise of opportunity based on
    personal relationships,
-   what are the main determinants influencing the actual impact of these
    resulting opportunities on SMEs internationalisation and growth

Additionally the supplementary questions are asked which then result in the
course of the conducted study:

-   what is the specificity of the analysed SMEs internationalisation process
    and especially hindrances of this process,
-   what kind of growth and development the analysed companies achieved
    due to internationalisation and their first foreign market entry.

Research method

The theoretical analysis presented in the article is exemplified with two
case studies. Both analysed companies while being small/ micro enterprises
operating only in the domestic market have acquired a large and important
foreign customer, thus starting their internationalisation process. Companies
selected for the case studies represent industries with different levels of
technological advancement, i.e. furniture industry and IT industry. The two
case studies may be seen as both comparative and complementary. The
same research questions used for analysis indicate the comparativeness
and using the two industries representing different levels of technological
advancement implies the complementarity.

The two case studies offer the chance to see and compare different aspects
of the analysed phenomenon. The furniture industry, classified as a low-
technology, is characterised by a high degree of embedding in local resources
but also a large extent of internationalisation (98% of Polish production was
exported in 2011 (http://stat.gov.pl/)). In turn the IT industry is classified
as high-technology knowledge intensive services. The high-technology
companies are said to be forced to be active on international scale because
the domestic market creates somewhat limited demand for their products/
services which have to be quickly commercialised (Madsen and Servais, 1997;
Spence, 2003; Ratajczak-Mrozek, 2012). However high-technology knowledge
intensive companies located in Poland do not impress both in terms of
turnover and production (both 9th place in the European Union in 2010) and
the level of exports (14th in the EU in 2011) (Figueira and Skaliotis, 2013).

Data for the case studies was collected using semi-structured, in-depth,
face-to-face and phone/Skype interviews (Silverman, 2000; Punch, 2005).
a purposive sample was applied. Altogether 13 in-depth interviews were
conducted. In the case of the furniture industry, 6 detailed interviews were
carried out with company owners as well as with 2 owners of companies
identified as being key suppliers. In the case of the IT industry, 4 detailed

interviews were carried out with the CEO of an IT company in Poland as well as 1 with the COO of the company's important client. In the case of both focal firms, additional contacts were made in order to obtain supplementary detailed information and in order to clarify doubts. The high positions held by the representatives of these firms ensured that they possessed the appropriate level of knowledge regarding topics covered by the research.

The interviews, which were carried out during the period January-October 2014, were conducted by two trained interviewers which aimed to ensure an objective assessment of the information obtained. The interviews were based mainly on open-ended and probing questions to encourage discussion of the phenomena (Denzin and Lincoln, 1998). The questions regarding the process of internationalisation, company's development and the identification and description of important customers, suppliers and other entities were asked. Crucial from the perspective of the article was to the question "how the company managed to acquire such a large and important foreign customer." The interviews were recorded and transcribed, thereby creating an interview protocol. In order to ensure objectivism and triangulation of the data interpretation (Gummesson, 2001) two researchers worked independently on the codification and analysis of the transcripts in order to assess the importance and strength of the relationship. Their analyses were compared and in the case of any inconsistencies, a third researcher was requested to assess the materials. Additionally, all of the companies' representatives had the possibility to verify the transcripts of their interviews. All significant comments regarding the transcript were incorporated into the data analysis.

The case studies adopt the perspective of two focal companies, however, verified using information obtained from the remaining entities. Unless otherwise noted the presented statements were presented by particular case focal company's representatives (furniture company – two owners, IT company – CEO). Both case studies are presented in the same order determined by the research framework.

Analysis– evidence from two industries

Furniture company

The Company Flow (Furniture Luxury of Wood; the name of the company was changed at its request), located in Poland with 100% of Polish capital, designs and produces furniture (mainly wardrobes, kitchen furniture, office furniture and bathroom furniture). This small company that employs less than 49 people, was founded in 2004. In 2013 the company had between 200-250 customers (both from B2B and B2C sector).

In the year 2011 Flow initiated the process of internationalising its operations, i.e. acquired a foreign customer – a large Scandinavian company operating in the recreational industry. This Scandinavian Customer is the company's only foreign customer. It mainly purchases wardrobes and in 2013 generated approximately 60% of the Flow's sales.

Thanks to the cooperation with the Scandinavian Customer, Flow was able to expand and, what is more, the cooperation "forces" a lot of innovation in the production process, the purchase of new machinery and means of transportation (which are both currently used to produce and provide services also for other customers). So acquiring foreign customer meant not only company's growth and internationalisation but also actual business development. In terms of growth there is also further potential internationalisation to be achieved as in the near future, the customer will possibly enter a new market in a new country which will mean that Flow will also expand its operations in to the new country.

How the company got such an important foreign customer and started its internationalisation process? As one of the Owners describes the process: "Someone, whom we know very well did some other work for this company. He said that he knew a company which produces furniture well. They asked us for the first production" Contact with the Danish customer was developed thanks to personal relationships on the local market and the word-of-mouth referral.

At the beginning of Flow's internationalisation process one more personal relationship built with one of local suppliers was particularly important: "when we received the first orders from the foreign customer, (…) we weren't able to purchase the required materials for cash. We went to the supplier, sat down, talked a while and the trust they placed in us means that we are still cooperating to this day." Since then this domestic wholesaler is classified as an important supplier for Flow due to the financial support he provided in the form of a trade credit. Without this relationship, Flow would not have been able to develop and specifically acquire the resources for product development.

What is also important is that the Owners underline the hindrance of the internationalisation process from the position of a SME which is the lack of international reputation. In such case: "who would read the offer we submitted to them?".

IT company

The IT micro-company Gridia was funded and began operating on the Polish market in 2006. The company started by offering basic IT services and later gradually started to transform in to a software development company.

In 2008 this IT company started its internationalisation process by cooperating with Scandinavian customers, including nSense Group where it was subcontracted to carry out outsourced IT development. The nSense Group is a highly specialised IT security company offering high-end security services to Northern Europe but also to the USA and Philippines. After confirming the high quality of services for nSense Group which were also low cost, there was a gradual expansion of the profile of the orders as well as an increase in trust between companies. Finally in 2010, there was a decision to create nSense Poland S.A. which became a new entity in the nSense Group structure. That meant that the Polish IT company had to formally cease trading but in practice: "we created a new company called nSense Poland S.A. where everyone, including the employees, was transferred and so in reality this was a continuation albeit not legally". The Polish branch does not have a marketing department, nor engage in final customer acquisition. It exports all of its services to the other companies forming the nSense Group (although end-beneficiaries of these services are Group's end-customers). In fact nSense Poland is right now a centre for knowledge and know-how of the Group, which only confirms company's development and growth.

How the IT company got such an important foreign customer, who at the end transformed into a partner in the same multinational company? As the CEO of the IT company describes the process: in 2008 also through personal relationships "we were able to acquire our first customer, a Polish branch of a Danish company (…). Then we became friendly with one of the company's managers who proposed that perhaps we could do something together. After a while he left that company and became our partner." The partner had knowledge of the Danish IT market and "was a Danish resident and had contacts there." because of the local contacts he had the role of the partner was to acquire customers and generate business. This Danish partner acquired nSense as a customer. In terms of the beginning of the internationalisation process the CEO of in that time micro IT company (that is from 2006 to 2008, before acquiring foreign customer) underlines that the company was not able to deliver its assumed growth strategy: "No large companies wanted to talk to us because we were only a two-person company.".

Discussion

The two case studies, although they apply to different industries (low-technology production furniture industry and high-technology knowledge intensive IT industry) point to many similarities in terms of embarking on an internationalisation process through SMEs' as well as their growth.

Firstly, regardless of the industry and its key resources determining competitive advantage, the most significant hindrance for initiating the internationalisation process is the lack of reputation. In the case of small, unknown firms, traditional strategic initiatives in such as market research or the submission of offers to potential foreign customers often do not provide results. Due to the lack of a reputation and the resulting difficulty in making an impact as well as a higher risk for potential customers, such offers from unknown companies are often not taken in to account when choosing a supplier.

The next barrier, albeit consciously referred to here secondly, are the limited resources of small companies. However, this is more important in the case of production firms (e.g. furniture production) where significant, specific material resources are required in order to deliver an order for a foreign customer, as opposed to a knowledge-intensive company (e.g. IT) where human resources and the specialist knowledge they possess are more important. The cases of the companies described, however, point to the fact that lack of resources for growth and development can be circumvented through the engagement in relationships at the local level (i.e. by being locally embedded). In the case of the furniture company, meetings with a local supplier, the development of trust and a good relationship allowed the company to obtain the resources required in order to deliver an order for the foreign customer and to thereby make the most of an opportunity which had presented itself.

Both of the case studies identified that locally embedded personal relationships are key for international opportunity emergence. Moreover these relationships, which are important in terms of growth, may be locally embedded personal relationships. In the case of the furniture company, the acquisition of the foreign customer was helped by the fact that the company obtained a recommendation from a contact. This recommendation was not in the form of a letter of reference or a set of references provided together with a proposal, but a personal recommendation provided by a contact who was asked to comment on the company. Moreover, this process was supported by the other locally embedded relationship, which has developed with the local supplier. In the case of the IT company, the acquisition of nSense as a foreign customer was both a strategic step as well as an example of an opportunity. The parties met in Poland whilst working on a local project and the mutual understanding between them meant that a personal relationship was formed and which was subsequently transformed in to a business relationship. Without meeting on the local market whilst working on a project with a local customer (albeit foreign owned) the relationship with nSense, an important foreign supplier, would not have been developed.

Based upon these examples, it can be concluded that locally embedded relationships simultaneously both facilitate and constitute opportunity recognition. The main factors determining the rise of opportunity based on personal relationship underlined by both companies' representatives are trust and mutual understanding, which apparently may be related to the idea of relational embeddedness.

Locally embedded relationships constitute a certain bridgehead facilitating opportunity recognition. Thanks to relationships, it is possible to break through the barrier of a lack of an international reputation. They allow for first contact. However, in order to be able to utilise an opportunity, owners must adopt the correct attitude, the willingness to take a risk and to be open. At the point at which an opportunity is taken, economic factors come in to play, which include competitive prices as well as a high level of professionalism and service quality. In the case of the furniture company it was the timely completion of high quality cheaper furniture. In the case of the IT company it was access to cheaper, highly qualified specialists, a significant growth factor due to the size of the Scandinavian market which is characterised by a limited supply of this type of labour. In every case these are therefore economic factors which are significant for a given industry.

Thanks to the contacts with foreign customers and thus entering into foreign markets, companies gained not only revenue growth (or in the case of a production company the growth of the machinery park), but also reached the development in terms of innovation (furniture company) and knowledge (IT company) which is highly desirable.

Conclusions

SMEs wishing to develop and striving for growth must often demonstrate a more ad hoc approach to internationalisation focused on exploitation of the opportunities. The theoretical and empirical analysis presented in the article points to the fact that relationships simultaneously facilitate opportunity recognition and themselves constitute such an opportunity. Moreover, research in to internationalisation usually concentrates on the importance of relationships with foreign counterparts. Meanwhile, the analysis carried out as part of the case study proved that locally embedded personal relationships can play a key role in the creation of international opportunities and the internationalisation process, especially in its initial phase. What is more, these do not have to be relationships with customers but also may be relationships with other persons or entities (e.g. suppliers). These relationships are particularly important in the case of lack of reputation or resources necessary for internationalisation. Research carried out in an

article has shown that main factors determining the rise of the opportunity based on personal relationships are trust and mutual understanding, in this way emphasising the importance of relational embeddedness.

The realisation of the emerging opportunities and therefore their impact on the internationalisation process and a company's growth requires additional factors which were identified in the case studies. These include social factors which are represented by an entrepreneurial attitude as well as economic factors (such as quality and competitive prices). Locally embedded relationships constitute a bridgehead facilitating opportunity recognition. Social factors are key for utilising opportunities which present themselves, namely the appropriate attitude on behalf of owners and managers (e.g. the willingness to take a risk or to be open) and then when the opportunity is being developed, economic factors come in to play which include competitive prices as well as the high level of professionalism and service quality.

The aforementioned dependencies are presented in Figure 2. What is important from the perspective of the analysis carried out in the article is that described dependencies were confirmed in the case of two completely different SMEs – a production company and a company based on non-material assets i.e. knowledge.

Figure 2. The process of transferring personal relationships in to SMEs internationalisation and growth - conclusions
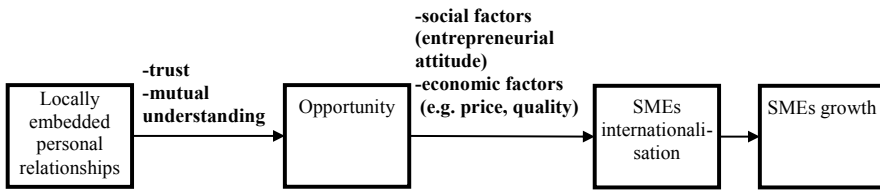
Source: Author's research.

Whilst discussing issues relating to the utilisation of opportunities in the internationalisation and growth processes of companies, the following statement made by the COO of the nSense Group is therefore significant: "in all entrepreneurial companies there is an element of a surprise and an element of just a coincidence". Are the described situations therefore only a case of luck? To a certain degree yes, if luck can be called meeting certain people. However, this is the only element of coincidence and luck. The development of a positive impression and opinion on the local market as well as the development of trust within local relationships demands both specific entrepreneurial characteristics facilitating the utilisation of a given

opportunity as well as the skill of being able to build economic factors significant for a given industry (the timely completion or orders, product quality, the specialist knowledge possessed by human resources, price). Without these elements, coincidence and the element of luck in the form of the development of the appropriate personal relationships would not develop in to a long-term business relationship leading to the internationalisation, growth and development of SMEs. However there is the need to consciously create network relationships both at the individual and company level. It is in fact the network of contacts as well as a positive opinion which can result in the appearance of an opportunity allowing an SME to overcome hindrances in the internationalisation process.

The presented research is not free of some limitations which simultaneously indicate future directions of research. First of all it would be advisable to carry out wider research which would facilitate a comparison of the importance of locally and foreign embedded relationships. This would be possible by carrying out studies among a larger number of cases as well as through a quantitative analysis. Above all, a detailed analysis of relationships as well as the interdependencies between factors (i.e. entrepreneurship and economic factors) would be also valuable.

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Abstract (in Polish)

Celem artykułu jest przedstawienie znaczenia lokalnie osadzonych relacji personalnych dla pojawienia się okazji dla małych i średnich przedsiębiorstw (MSP) w procesie ich internacjonalizacji (a szczególnie w fazie wejścia na rynek zagraniczny) oraz wzrostu. Ponadto celem artykułu jest identyfikacja czynników warunkujących rzeczywiste wykorzystanie i przełożenie tak powstałej okazji na internacjonalizację i wzrost przedsiębiorstw.

W artykule zastosowano zarówno podejście koncepcyjne jak i empiryczne do analizy problemu bazując na krytycznej analizie literatury przedmiotu. Przedstawiono również dwa studia przypadków przedsiębiorstw reprezentujących dwie branże o różnym poziomie zaawansowania technologicznego, tj. branżę meblarską i branżę IT.

Przedstawiona w artykule analiza teoretyczna i empiryczna wykazała, że relacje jednocześnie umożliwiają rozpoznanie okazji jak i same stanowią taką okazję. Przeprowadzona analiza studiów przypadków dowiodła, że głównymi czynnikami mającymi wpływ na przełożenie relacji personalnych na pojawienie się okazji są zaufanie i wzajemne zrozumienie, podkreślając tym samym znaczenie osadzenia relacyjnego. Przy czym trzeba podkreślić, że tak jak te relacje wspomagają tworzenie okazji, tak już dla ich zrealizowania i przełożenia na internacjonalizację i wzrost przedsiębiorstwa, niezbędne są dodatkowe zidentyfikowane w przedstawionych badaniach czynniki w postaci czynników społecznych reprezentowanych przez postawę przedsiębiorczą oraz czynników ekonomicznych (takich jak jakość i konkurencyjne ceny).

Słowa kluczowe: *relacje, relacji personalne, lokalne osadzenie, internacjonalizacja, wejście na rynek zagraniczny, okazje, MSP*

Biographical Note

Milena Ratajczak-Mrozek is an Assistant Professor in the Department of International Marketing at the Poznań University of Economics. She is the

scholarship holder of Minister of Science and Higher Education (scholarship for outstanding young scientists) and author of over 60 publications. She has conducted research projects for both science and business (in the field of cooperation, innovativeness and foreign activity). Her main areas of research include the analysis of companies' relationships and cooperation in international setting as well as competitive advantage in the global market. She is a member of a few international scientific organisations: The European International Business Academy (EIBA), The European Marketing Academy (EMAC) and an international research group Industrial Marketing and Purchasing Group.

Building a model of successful collaborative learning for company innovativeness

Agata Sudolska[1], Andrzej Lis[2]

Abstract

Text: *The aim of the paper is to develop a model of successful collaborative learning for company innovativeness. First of all, the paper explores the issue of inter-firm learning, focusing its attention on collaborative learning. Secondly, inter-firm learning relationships are considered. Thirdly, the ex ante conditions of collaborative learning and the intra-organizational enhancers of inter-firm learning processes are studied. Finally, a model of the critical success factors for collaborative learning is developed.*
Keywords: *innovativeness, inter-firm learning, inter-firm relationships, collaborative learning, critical success factors for collaborative learning.*

Introduction

Nowadays, the ability to learn is perceived as one of the most important intangible assets that a firm can possess. This corresponds with the view that knowledge is a very suitable resource to be used for building the enterprise's competitive advantage (Amit and Schoemaker, 1993; Prahalad and Hamel, 1990). As highlighted by Teece (1998, p. 62) "the competitive advantage of companies in today's economy stems not from market position, but from difficulty to replicate knowledge assets and the manner in which they are deployed". This opinion refers to the fact that knowledge meets the most important characteristics of strategic resources necessary to build long term competitive advantage. Knowledge, as a typical strategic resource, is: valuable, rare, difficult to imitate and difficult to replace by other resources (cf. Barney, 1991).

In contemporary business, the idea of inter-firm cooperation is said to be one of the key elements of the modern management model that answers the challenges of the global economy. Nowadays, the issue that becomes

1 Agata Sudolska, dr hab., prof. UMK, The Faculty of Economic Sciences and Management, Nicolaus Copernicus University, Toruń, Poland. aga@econ.uni.torun.pl
2 Andrzej Lis, dr, The Faculty of Economic Sciences and Management, Nicolaus Copernicus University, Toruń, Poland. Doctrine and Training Centre of the Polish Armed Forces, Bydgoszcz, Poland. andrzejlis@econ.umk.pl

significant is company innovativeness which has been recognized as the foundation for strengthening its competitiveness. Due to spreading "New Economy" conditions, the process of creating innovations is changing. Market observation proves that very often innovations are stimulated by inter-firm learning which takes place within the relationships with other companies (Mitra, 2000, pp. 228-229; Vanhaverbeke, 2008, p. 208., Wang, Rodan, Fruin and Xu, 2014, p. 484).

There is a considerable agreement among researchers on the fact that innovation can be stimulated through interactive learning processes. Every enterprise operates in a network of relationship ties with its customers, suppliers, competitors, business support organizations etc. This network of business relationships influences the single company's capacity to be innovative (Mohannak 2007; Chesbrough, 2008). Still growing number of authors (e.g. Mu, Peng and Love, 2008; Cowan, 2007; Vanhaverbeke, 2008; Kastalli and Neely, 2014) claim that enterprises which establish and develop inter-firm relationships are more successful in the field of innovation than the firms that do not implement cooperation strategy. It is becoming clear that complex challenges of today's environment require collaborative and innovative solutions. Companies acting alone are not best placed to seize available opportunities or respond to the challenges they face (Kastalli and Neely, 2013, p. 4). This is related to the fact that inter-firm cooperation improves the single enterprise innovative capacity by reducing uncertainty through information and knowledge access, sharing, screening and by establishing a longer term focus on relationship building in order to develop organizational competences. Inter-firm business relationships create the opportunities to reach global markets, absorb new technologies, share knowledge, human and material resources (Saarenketo, Kuivalainen, Kylaheiko and Puumalainen, 2004).

The enhancement of firm's ability to learn very often becomes the main reason for entering into relationships with other enterprises. It refers to the fact that firm's innovativeness and competitiveness depend on its ability to integrate different kinds of knowledge and to coordinate the knowledge flow among different organizations in the market. Taking this into account, today many enterprises adopt cooperative strategies with the intention of acquiring new knowledge and know-how. They realize that focusing on creating inter-firm sustainable relationships results in having contact with "knowledge milieus" beyond their local environments. This means that they can gain the access to technological competencies and know-how that are not available in their local environments. While having established external relationships, companies are more able to gain assistance with technology development and innovation when a particular need arises (Mohannak, 2007,

p. 246). What is more, as proved by Yang, Lin and Peng (2011), the inter-firm learning between the members of a strategic alliance is a factor triggering acquisitions of alliance partners. Making a distinction between exploration and exploitation alliance learning (cf. March 1991), Yang et al. (2011) find that it is particularly applicable in the case of exploration learning which is a long-term approach oriented to the development of new competencies in order adapt to the changing environment.

The opinions and findings presented above highlight the role of inter-firm learning processes in strengthening company innovativeness. Inter-firm learning, considered as an element of the cooperative strategy, seems to be a prerequisite for business success. Collaborative learning is one of factors motivating managers to establish inter-firm cooperation. In order to benefit from collaborative learning outcomes, cooperating companies should manage these processes and create conditions which enable such initiatives to flourish. The antecedents and determinants of effective inter-firm learning and knowledge transfer are often discussed in the literature (cf. Cummings and Teng, 2003; Martinkenaite 2011; Lawson and Potter, 2012) which confirms the importance of the problem. Nevertheless, the understanding of critical success factors for effective inter-firm learning still seems to remain unclear and to need further exploration.

Therefore, the aim of the paper is to develop a model of successful collaborative learning for company innovativeness. In order to achieve the main aim of the paper, the following operational objectives have been established: (1) to discuss the problems of the structural conflict between competition and collaboration which are typical of inter-firm learning and to identify the types of collaborative learning; (2) to define and understand inter-firm learning relationships; (3) to identify and study the ex ante conditions of successful collaborative learning; and (4) to identify and study the intra-organizational enhancers of successful collaborative learning.

The study is based on purposeful selection of articles (narrative review). The sources used for analysis encompass two main areas (types) of literature: knowledge management and strategic management. The paper provides an overview of recent contributions to the literature on inter-organizational learning and inter-firm relationships.

The paper is structured around the aforementioned research objectives. First of all, the paper explores the issues of inter-firm learning, focusing its attention on collaborative learning. Secondly, the issues of inter-firm learning relationships are considered. Thirdly, the ex ante conditions of collaborative learning and the intra-organizational enhancers of inter-firm learning processes are studied. Finally, a model of the critical success factors for collaborative learning is developed.

Inter-firm learning: between competition and collaboration

Organizational learning is the essence of knowledge management. As highlighted by Jashapara (2004, p. 12), knowledge management can be defined as „the effective learning processes associated with exploration, exploitation and sharing of human knowledge (tacit and explicit) that use appropriate technology and cultural environments to enhance an organization's intellectual capital and performance". In fact, organizational learning combines the potential of knowledge with the efforts for the improvement and development of an organization. Such views are embodied in the definition by Fiol and Lyles who claim that "[o]rganizational learning means the process of improving actions through better knowledge and understanding" (Fiol and Lyles, 1985, p. 803).

Inter-firm learning is perceived as an extension of organizational learning, developing enterprise knowledge and providing new insights into the firm's strategy. It is a process of acquiring, disseminating, interpreting, using and storing the information within or across the firm that leads to creating knowledge affecting its innovativeness and competitiveness on the market. Inter-firm learning takes place within inter-firm structures such as different types of business relationships and networks that enable companies to tap into technologies, products and markets which would otherwise beyond their own resources (Mathews, 1996; Makinen, 2002). While establishing any business relationship, a firm becomes a part of the cooperative interaction process that results in learning more about itself as well as leveraging its competences through absorption of new knowledge.

Generally, there are two possible learning relationships between cooperating partners: collaborative learning and competitive learning. The structural conflict between cooperation and competition is an inherent feature of any inter-firm relationship, in particular a strategic alliance. The same dilemma is highly visible in the area of inter-firm learning. Collaborative learning is understood as a reflective cognitive process in which the engaged parties (enterprises) capitalize on one another's resources and skills. They engage in a common task where each company depends on and is accountable to each other. This refers to the situation in which learning takes place through explicit or implicit collaborative efforts. Collaborative learning is characterized by mutual benefits for both partners willing to develop and strengthen cooperation over time in order to create the effect of synergy. Competitive learning occurs when one of partners tries learn as much as possible from the other one without contributing to mutual learning (Child, Faulkner and Tallman, 2005, p. 279-282). The nature of the conflict from the perspective of inter-firm learning is very accurately noticed by Mohr and Sengupta (2002, p. 282) who claim that "[o]n one hand, inter-firm learning is a desirable

extension of organizational learning, developing a firm's knowledge base, and providing fresh insights into strategies, markets, and relationships. On the other hand, inter-firm learning can lead to unintended and undesirable skills transfer, resulting in the potential dilution of competitive advantage". In consequence, as observed by Mohr and Sengupta (2002, p. 286-287), two opposite pictures of inter-firm learning ("rosy" vs. "risky") are painted in the literature. According to the proponents of the "rosy" picture, an inter-firm learning partnership enables cooperating companies to achieve better competitive position and to improve their organizational skills. An effective knowledge transfer is stimulated by interdependence of partners, openness, trust and the variety of interaction channels. Partners trust each other, show high level of commitment to the relationship and willingly share knowledge. The relationships between cooperating organizations are characterized by high, symmetrical interdependence and close interpersonal ties. Integrative conflict resolution, harmony and the longevity of a relationship are the indicators of the partnership success. The opposite, "risky" picture of inter-firm learning focuses its attention on potential threats of losing valuable information and knowledge which may result in the increased vulnerability to competition. Knowledge transfer is primarily associated with outlearning one's partner by another. Therefore, it is recommended to restrict learning interactions in order to reduce potential knowledge leakages. Relationships between partners are characterized by: lower level of trust and commitment, limited information and knowledge sharing, asymmetrical interdependence and more distant interpersonal relationships. The measures of partnership success include: some contentiousness and ending partnership relationships when learning objectives are attained.

Nowadays, collaborative learning that is a part of inter-firm relationships provides the building blocks to access new or lacking capabilities. By enlarging one firm's knowledge base and accessing the knowledge that can augment its sources of expertise, collaborative learning may help a company to strengthen its innovativeness and its market position. Due to this, collaborative learning has far-reaching implications for filling knowledge assets gaps existing in firms and improving their ability to create and commercialize innovations (Gulati, 2007, p. 31-72; Donaldson and O'Toole 2007, p. 27-28).

The following forms of collaborative learning are identified: learning from experience, learning about a partner, learning from a partner and learning with a partner (Inpken, 2002; cited after Child et al., 2005, p. 275-279). Firstly, enterprises have the opportunities to learn from their partners' experience. Experiential learning can be useful for planning and managing subsequent partnership initiatives. Lessons learned from previous partnership play an important role when making decisions on joining another one. Secondly,

at the pre-relationship stage, learning about a partner organization, its motivations and capabilities is necessary to make right decisions and properly prepare a partnership agreement. When a partnership is established two remaining forms of learning occur. Learning existing knowledge and skills from a business partner is the first option. This kind of learning comes about through the transfer of knowledge into a different company for which it represents a new input. Such a transfer is usually observed while a firm aims at technological complementarity and its development or launching new products. Learning with a business partner is the second one. This type of collaborative learning includes the creation of new knowledge or at least a substantial transformation of the knowledge already existing within a particular relationship. Such a kind of process refers to mutual learning which occurs through an integration of different inputs offered by cooperating enterprises. In recent decades it has been recognized that the motive behind most technology alliances is to capture the innovation synergies that may arise from pooling complementary knowledge and capabilities.

Inter-firm learning relationships

Recent years have seen an increased interest in the issues concerning the development of firm's learning abilities and the process of creating innovations. As a consequence, today there is a considerable agreement among researchers and practitioners on the view that innovations are generated mainly through cooperation and learning with other companies, such as suppliers or even competitors with whom the firms set up strategic alliances. Such a tendency refers to the fact that various inter-firm relationships enable partners to develop new capabilities. This results in the filling several assets gaps existing in cooperating companies and in improving their ability to learn and create new processes or products (King, Covin and Hegarty, 2003, p. 592; Perks, 2004; p. 39-41; Stańczyk-Hugiet, 2013, pp. 66-67).

The idea of developing inter-firm relationships focused on increasing firms' potential for creating innovations is an inherent part of the open innovation paradigm that treats R&D as on open system. This paradigm has been introduced by Chesbrough who suggests that valuable ideas can come from inside or outside the firm and can go to market from inside or outside it as well. In other words, the open innovation paradigm proposes the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation (Chesbrough, 2008, p. 1). While open innovation is practiced firm's boundaries are "porous". It means they allow knowledge to flow in and out of the company at any point during the R&D process. Company policy dictates what kind of knowledge

can flow in which direction and under what circumstances (Gaule, 2006, p. 13). Due to aforementioned, we may say that open innovation is almost by definition related to establishing ties of innovating companies with other organizations on the market. It implies an extensive use of inter-firm ties to insource external ideas and to market internal ideas through external market channels outside a company's current business (Vanhaverbeke, 2008, p. 205-208).

When considering the issue of inter-firm learning relationships, first of all we should define and understand what inter-firm business relationships are. Some authors emphasize that it is necessary to distinguish between relationships and interactions. "The relationship elements of the behavior are rather general and long-term in nature. Interactions, by contrast, represent the *here and now* of inter-firm behavior and constitute the dynamic aspects of relationships" (Easton, 1992, p. 8). Therefore, we can point out that business relationships are the relatively enduring transactions, flows and linkages that occur among or between a company and one or more other organizations in the environment. What is typical, inter-firm relationships encompass a wide range of elements such as mutual orientation of cooperating parties, the interdependence between business partners as well as some investments each firm has made in particular relationships (Easton, 1992, p. 8). Such investments are understood as the undertakings which allocate specific resources to generate or acquire assets to be used by the partners in the future (Johansson and Mattson, 1985).

Given the fact that nowadays firm's competitiveness is associated with its innovativeness and the ability to learn, the so called inter-firm learning relationships can be identified. Companies establishing such business relationships are aimed at knowledge transfer or common creation of new knowledge that is needed by them to sustain their competitiveness. Such relationships are based on learning from each other or together in order to create valuable knowledge assets through synergy that neither would have been able to achieve by the cooperating companies acting individually (Sudolska, 2011, p. 79). What is significant, enterprises that are embedded in such partnerships agree to change the way they do business, integrate and jointly control some parts of their business systems. They also agree to share knowledge in the benefit of cooperation.

Combining the findings by Child and Markóczy (1993) and Inpken (1995), Child et al. (2005, p. 289-292) identify the following forms of inter-firm learning relationships: forced learning, imitation or experiential learning, blocked learning, received learning, integrative learning, segmented learning and non-learning. In their typology they distinguish three features of cooperative learning situations: changes in cognitive and behavioral learning

and the level of motivation to learn. Considered rather as an adaptation, *forced learning* is typical of asymmetric partnerships, when a less powerful partner changes its behaviors but no cognitive internalization is observed and motivation to learn is very low. As motivation increases to the moderate level, *learning by imitation* emerges. This type of learning is typical of early stages of collaboration and may evolve into more advanced forms. In case of forced learning and learning by imitation, the lack of knowledge internalization and understanding is a key problem. An opposite situation is noticed in case of *blocked learning*. This is the situation when the personnel who have received training from a partner company and have internalized new knowledge are not able to put this knowledge into practice due to insufficient position in the organizational hierarchy or the lack of financial resources (cognitive change and high motivation are not able to trigger changes in organizational behavior). In case of received learning and integrative learning, both partner organizations change their cognitions and behaviors. The difference is whether it is an asymmetric (unilateral) motivation to learn (*received learning*) or both partners willingly share their knowledge and skills (*integrative learning*). When partner motivation for cooperative learning is low and changes in cognition/behavior are narrowed, *segmented learning* is observed. Finally, *non-learning* is the last possible situation in cooperative partnerships studied from the inter-firm learning perspective.

While analyzing the matter of inter-firm learning relationships focused on collaborative learning, we should remember that among the benefits of such business relationships several authors point out learning specific skills as well as developing competencies. Learning through business relationships is an important intangible benefit of inter-firm cooperation due to the fact that it helps a firm to secure a global market share and its competitive advantage. Moreover, developing core competencies thanks to inter-firm relationships enables a company to leverage knowledge gained from relationship partners in other markets (Simonin, 1997; Berdrow and Lane, 2003; Palakshappa and Gordon 2007).

Concluding, inter-firm relationships focusing on learning on one hand refer to the company's competence building and on the other hand to the competency leveraging that means applying competencies to contemporary market opportunities. Both mentioned actions are taken by companies to generate learning resources that enable them to increase their innovativeness (Mitra, 2000). Taking this into account we may say that a company knowledge base is influenced by and partly derived from the business relationships in which they are embedded.

The ex ante conditions of successful collaborative learning

Successful collaborative learning to occur requires some ex ante conditions which are the prerequisites of effective inter-firm learning processes. Child et al. (2005, p. 282-289) enumerate the three following requirements for a company to be able to learn effectively from other members of a strategic alliance: partner intensions, their capacity to learn and ability to convert knowledge into an organizational property.

First of all, partner intentions refer to the company's goals for particular relationship. According to Beamish and Berdrow (2003), for learning to provide real value there needs to be a conscious intent to learn. In regard to partner intentions, collaborative and competitive motivations should be distinguished. Organizations showing collaborative intentions are generally oriented to long-term relationships aimed at accessing partner knowledge and skills. Companies driven by competitive intentions focus on enhancing their competitive positions by internalizing partner knowledge and skills. Achieving their aim, such companies are not interested in the longevity of an alliance (Child et al., 2005, p. 283-284). With the regard to the intentions of the firms creating the relationship aimed at learning, it is necessary to emphasize the level of enterprise's determination concerning the need for new knowledge. According to the survey conducted on 147 companies by Simonin (1997), learning intent is a very strong and consistent predictor of knowledge transfer within business relationships.

Secondly, partner capacity to learn is another prerequisite of effective inter-firm learning. Such an ability depends on knowledge transferability from one partner to another, receptivity of organization members to new knowledge, their ability to recognize the value of external knowledge, assimilate and apply it and on partner lessons learned from previous relationships (Simonin, 2004, p. 410).

Thirdly, the requirement of converting knowledge into an organizational property refers to the company ability to manage interactions between tacit and explicit knowledge. As such, it can be explained by the Nonaka and Takeuchi (1995) model describing four different modes of organizational knowledge conversions: socialization, externalization, combination and internalization. Although some researchers (e.g. Gourlay, 2003; Gourlay, 2006; Powell, 2007) criticize the SECI framework and its assumptions it remains one of the most seminal models describing knowledge conversion processes.

The company capacity to learn and ability to convert knowledge into an organizational property may be explained by the concept of absorptive capacity popularized by Cohen and Levinthal (1990). According to these authors, absorptive capacity is the ability of a company to recognize the value of new external knowledge, assimilate it, and apply to commercial

ends (Cohen and Levinthal, 1990, p. 128). Absorptive capacity includes four components: identifying and recognizing external knowledge, processing and understanding it, combining it with existing knowledge and applying the new knowledge to commercial ends (Cohen and Levinthal 1990, Zahra and George 2002). Firms differ in their abilities to acquire and use external knowledge. Recent research shows that firms operating under similar external conditions display notable differences in the features of their organizational knowledge bases which in turn affect their absorptive capacity (Nag and Giola, 2012, p. 422).

The ability to identify and recognize the value of external knowledge is the first step to develop company's absorptive capacity. Several authors argue that enterprises that present high level of receptivity to new knowledge are those which are most successful in learning together through business relationships (Hamel, 1991; Child et al., 2005, p. 285-287). Firm's receptivity to new knowledge is recognized as a kind of business attitude. Today there is a considerable agreement among writers and practitioners on the view that company's receptivity refers to the ability to recognize the desired knowledge or/and to assess the potential of common creation of new knowledge with particular partner. Such ability is directly related to company's competences which result from the firm's level of prior related knowledge (Cohen and Levinthal, 1990; Child et al., 2005, p. 285-286; Trott, 2008, p. 330). The next step in learning through knowledge absorption is combining the new knowledge with the one existing within the firm and applying the new knowledge to innovation. The success of these two steps depends on prior, related knowledge as well as the level of its resources that are engaged in the activities focused on gathering knowledge and embedding it within its own business routines (Cohen and Levinthal, 1990; Child et al., 2005, p. 286; Nag and Giola, 2012, p. 422). The all mentioned components of absorptive capacity are necessary and together they influence the extent to which knowledge received by a partner benefits its performance (Chang, Gong and Peng, 2012, p. 931).

The concept of absorptive capacity developed by Cohen and Levinthal (1990) has been reexamined and reconceptualized in subsequent studies. For instance, Zahra and Goerge (2002) highlight the dynamic character of absorptive capacity defining it as "a set of organizational routines and processes by which firms acquire, assimilate, transform and exploit knowledge to produce a dynamic organizational capability" (Zahra and Goerge, 2002, p. 186). The authors distinguish four dimensions of absorptive capacity and group them into two constructs: potential absorptive capacity (acquisition, assimilation) and realized absorptive capacity (transformation and exploitation). Moreover, they claim that previous studies have neglected

the issue of contingent factors which determine the use of absorptive capacity to build up and strengthen the company competitive advantage. Therefore, Zahra and George (2002, pp. 191-197) extend the catalogue of absorptive capacity antecedents listing among them: external sources and knowledge complementarity, experience, activation triggers (internal or external events stimulating a company to respond), social integration mechanisms and regimes of appropriability ("institutional and industrial dynamics that affect the firm's ability to protect the advantages of (and benefits from) new products and processes"). Finally, Zahra and George (2002, pp. 195-196) analyze the impact of absorptive capacity on the company competitive advantage. They argue that knowledge transformation and exploitation (realized absorptive capacity) are the key success factors for achieving competitive advantage and product development because they facilitate the use of knowledge for commercial purposes whereas knowledge acquisition and assimilation (potential absorptive capability), which enable an organization to explore new knowledge, are particularly important for sustaining competitive advantage.

The assumptions of Cohen and Levinthal's (1990) concept of absorptive capacity and its reconceptualization by Zahra and George (2002) are reexamined by Todorova and Durisin (2007). In their study, they criticize some of Zahra and George's (2002) proposals (e.g. the distinction between potential and realized absorptive capacity) and point out some ambiguities and omissions. Todorova and Durisin (2007, p. 782) propose to include power relationships ("that involve the use of power and other resources by an actor to obtain his or her preferred outcomes") into the list of contingency factors and antecedents of absorptive capacity. Their proposal encompasses both intra-organizational power relationships and external relationships (e.g. with customers). As regards other antecedents, Todorova and Durisin (2007, p. 781) "argue that social integration mechanisms influence all components of absorptive capacity and that the influence can be either negative or positive according to the type of new knowledge and the type of knowledge processes. Then, they postulate further studies to investigate ambiguous effects of the regimes of appropriability both on absorptive capacity antecedents and outcomes (Todorova and Durisin (2007, pp. 781-782). Moreover, referring to the assumption of dynamic nature of absorptive capacity, Todorova and Durisin (2007, pp. 782-783) highlight the role of feedback links between the company absorptive capacity and its knowledge base.

Sun and Anderson (2010) reexamine the issue of absorptive capacity in the context of its relationship with the concept of organizational learning. They prove that absorptive capacity and organizational learning share conceptual affinity due to similarities in theoretical background, antecedents and observable outcomes. The key point of their reasoning is that "ACAP [absorptive

capacity] should be considered as a specific type of OL [organizational learning] which concerns an organization's relationship with external knowledge" (Sun and Anderson, 2010, p. 141). Among the antecedents of absorptive capacity and organizational learning, which are especially important from the point of view of this paper, Sun and Anderson (2010, pp. 139-140) enumerate: external environment knowledge sources, "cross-functional interfacing, participatory decision-making, job rotation, social relationship, strategic focus, organizational structure, R&D effort, organizational crises and mental models". a model describing a nature of relationship between absorptive capacity and organizational learning is the result of studies by Sun and Anderson (2010, p. 142). Their model illustrates relationships between the components of absorptive capacity identified by Zahra and George (2002) (i.e. knowledge acquisition, assimilation, transformation and exploitation) and the organizational learning processes enumerated by Crossan, Lane and White (1999) (i.e. intuition, interpretation, integration, institutionalization). Knowledge acquisition is considered as a learning capability including intuition and interpretation processes at individual and group levels of learning. Knowledge assimilation is a group learning activity involving interpretation processes. Knowledge transformation, observed at group and organizational levels, is related to integration processes. Knowledge exploitation involves the process of institutionalization at the organizational level. Another contribution of the discussed paper is the identification of factors influencing the aforementioned components of absorptive capacity. Sun and Anderson (2010) enumerate the following antecedents of:

- knowledge acquisition: type of intuition of the members of an organization who receive external knowledge (distinction between entrepreneurial and expert intuition);
- knowledge assimilation: dialogue, diversity of team members' experience and an environment supporting innovativeness;
- knowledge transformation: ambidextrous leadership combining transactional and transformational styles and sand-pit experimentation enabling an organization to test new knowledge;
- knowledge exploitation: leaders' ability to apply appropriate reward and recognition mechanisms and effective allocation of organizational resources.

In their conceptual framework, Mohr and Sengupta (2002, p. 289-297) claim that an effective knowledge transfer between cooperating partners is determined by the fit between ex ante relationship conditions and an appropriate type of corporate governance mechanism. According to their understanding an effective knowledge transfer should meet two requirements: to maximize desired learning and to minimize undesired learning (an access to sensitive information and knowledge). The ex ante relationship conditions

include three main elements: type of knowledge, partner learning intent and the duration of the partnership. As regards the type of knowledge, the more knowledge is converted from tacit to explicit, the higher potential learning risks are observed. In case of partner learning intent, such a risk is aggravated as the intent shifts from knowledge access to knowledge internalization. The duration of a relationship depends on benefits for partner organizations: the higher benefits, the longer duration. In consequence, extending the time of a relationship results in more knowledge transfer between partners.

Concluding, the literature review enables us to identify the four following ex ante conditions of successful collaborative learning: (1) type of knowledge, (2) partners' intensions, (3) partners' receptivity and competences and (4) anticipated relationship duration.

Collaborative learning enhancers

In addition to the ex ante conditions discussed above, successful collaborative learning requires some elements of positive inter-firm potential such as: (1) corporate governance mechanisms within a business relationship, (2) trust between cooperating companies, (3) effective inter-firm communication, and (4) partner commitment. We define the aforementioned elements as collaborative learning enhancers. The notion of positive inter-firm potential is the extension of the concept of positive organizational potential coined and developed by Stankiewicz and his associates (2010, 2013). The roots of positive organizational potential derive from the Positive Organizational Scholarship movement (cf. Cameron, Dutton and Quinn, 2003) and the idea of company competitive potential cf. Stankiewicz 1999, 2002) embedded in the Resource-Based View of an organization (cf. Barney, 1991).

Relationship governance mechanisms

Corporate governance mechanisms within a business relationship are directly related to the issue of control. Control as the aspect of relationship management, might be understood as a process whereby managers from partnering firms are able to initiate and regulate the conduct of activities in such a way that their results accord with the goals and expectations held by them (Child et al., 2005, p. 214). Control over a relationship is widely regarded as a critical factor for successful performance of any cooperation (Malhotra and Lumineau, 2011). For instance, the role of governance mechanisms for inter-firm learning is confirmed by the findings from the questionnaire survey among Taiwanese high-tech companies. As observed by Wu, Wu and Lo (2004, p. 461) "contractual governance and procedural governance are the two contributory factors of learning effectiveness and relationship

performance in strategic alliance". On the other hand, insufficient control can restrict partner's ability to protect as well as efficiently utilize the resources it provides to the relationship and to achieve the goals it has set for a particular partnership (Child et al., 2005, p. 215).

The mechanisms of control introduced by the partners guarantee predictability of the course of events and improve the conduct of operational management within a relationship. Among all mechanisms of control, it is important to distinguish two main categories. The first one includes formal contractual agreements which set out certain rights to the partners. Such agreements concern reporting relationship upwards from one firm to another, formalizing its planning, approval for resource allocation, laying down the procedures to follow within cooperation etc. On the other hand, there is the category involving informal mechanisms. They may comprise the maintenance of regular personal relations with the top managers who take the responsibility of particular partnership. Moreover, cooperating firms may assign the managers with sufficient time and resources to monitor the progress of common work and to support it with the necessary personal contact. Such informal methods of control over the relationship can have considerable potential enhancing operational control due to the fact that they help shaping the values and relational norms typical of particular cooperation as well as they support mutual understanding between partners (Fryxell, Dooley and Vryza, 2002).

Corporate governance mechanisms should be correlated with the ex ante conditions of a given partnership. Addressing the challenges of managing an effective inter-firm knowledge transfer Mohr and Sengupta (2002, p. 293) highlight the increasing role of corporate governance mechanisms: "as the partner is perceived as having internalization (versus access) intents, as the type of knowledge sought by the focal firm goes from explicit to tacit, and as the duration of the alliance goes from short term to long term risk can be minimized by crafting appropriate governance mechanisms".

Trust

Most scholars agree upon the importance of another variable fostering successful collaborative learning that is trust (Gulati, 1995; Adbor, 2002; Hunt, Lambe and Wittman, 2002; Heffernan, 2004; Mellat-Parast and Digman, 2007). The relevant literature proposes different conceptualizations of inter-firm trust. Some authors perceive trust rather as predictability, while others emphasize the role of partners' goodwill. Nevertheless, common to most approaches to define inter-firm trust are the confidence between business partners that the other firm is reliable and that the cooperators will

act with a level of integrity while dealing with each other (Morgan and Hunt, 1994a; O'Malley and Tynan, 1997). It means that cooperating firms believe that the other's actions will be beneficial rather than detrimental to the first partner, even if it cannot be guaranteed. So trust can be said to exist between relationship partners while it involves a high degree of predictability on all sides, that the others will not engage in opportunistic behavior. As highlighted by Child et al. (2005, p. 50), inter-firm trust refers to collaborator's sufficient confidence in a partner to commit valuable know-how or different resources to a relationship despite the fact that there is always a risk the partner will take advantage of this commitment.

There are three components of inter-firm trust: competency trust, contractual trust as well as goodwill trust. Competency trust refers to the expectation that a relationship partner is able to perform at a set level. The second component – contractual trust – concerns specific oral or written agreements between companies. Goodwill trust refers to partners' willingness to do more than it is formally expected (Sako, 1992; Sirdeshmukh, Singh and Sabol, 2002). Trust is recognized as the fundamental component for the success of all kinds of inter-firm relationships due to fact that any type of cooperation creates mutual dependence between partners. a significant variable influencing trust between cooperating firms that focus on collaborative learning is convergence over their strategies (Valkokari and Helander, 2007). While the partners of the relationship share common strategic vision, the foundation for common learning is made up in a natural way. If partners set up similar objectives, they obviously present a high level of commitment and do not hesitate to share their knowledge assets. Such a situation frequently results in generating specific knowledge that becomes a partners' common asset. This, in turn, strengthens mutual trust existing between collaborating companies.

With the regard to the issue of inter-firm trust, it is necessary to point out that trust within any relationship develops gradually as the cooperating companies move from one stage of a relationship to the next one. Combining the approaches by Lewicki and Bunker (1996) and Ford, Gadde, Hakansson and Snehota (2003, p. 49-58) we can state that that the trust existing between relationship partners changes its character over time. At the beginning stage of a relationship trust between companies is based on calculations made by them. Then, firms act together and their common outcomes confirm the validity of calculative trust. This situation encourages repeated interactions and partners begin to develop the knowledge base about each other. This is the stage at which partners have already proved to be consistent and reliable and to share their expectations about the relationship. As a result, cooperators prove to be predictable. At that stage partners enter the level of

inter-firm trust which now is based on mutual understanding which is called also knowledge-based or cognitive trust (Lewicki and Bunker, 1996, p. 121-123; Child et al., 2005, p. 56-67). Knowledge-based trust that occurs between cooperators leads to a higher level of their engagement into the relationship, intensive mutual learning towards the specifics of the relationship as well as the investments made by partners and establishing norms that guide conduct. As partners gradually obtain the desired results from the relationship, they begin to identify with each other's goals and interests. At this stage of relationship, the development of mutual trust based on personal identification is likely to occur. That is the highest level of relationship trust, which partially emerges from the issues relating to goodwill and competency, recognized by each partner at earlier stages of the relationship development process.

Communication

Being aware of inter-firm trust importance, it is necessary to focus on its relations with the process of communication between collaborating firms. In line with relevant literature, the communication system that exists within a relationship is another significant condition fostering successful collaborative learning (Morgan and Hunt, 1994b; Adbor, 2002; Hunt, Lambe and Wittman, 2002).

According to most approaches, communication is recognized as the foundation process that facilitates the inter-firm relationship development and its ongoing maintenance. It results from the fact that the process of reciprocal communication creates shared meanings between partnering enterprises. Consequently, the predictability concerning partners' behavior arises from these shared meanings. Moreover, it has been recognized that also partners' good will appears as the result of their participation in the communication process whereby shared meanings are created (Hardy, Philips and Lawrence, 2000, p. 69).

Given the fact that inter-firm trust grows out of a communication system, communication between collaborating enterprises may be seen as a kind of "glue" that holds the partners of the relationship together. It is not possible to build a strong and successful inter-firm relationship aimed at collaborative learning without the knowledge and understanding of how communication influences the behavior of cooperating partners.

Communication within the relationship focusing on common learning should be an ongoing dialogue. In close inter-firm relationships it is all about a dialogue where people and organizations learn from each other, change and adapt. The dialogue concept incorporates the idea that between cooperating

firms there are exchanges rich in information and capable of creating new knowledge (Donaldson and O'Toole, 2007, p. 149-150).

In the framework of inter-firm communication, two most common measures are distinguished. The first measure is associated with the mechanistic approach. The mechanical facets of communication include: the message content, the channel mode (formal and informal), feedback and frequency. On the other hand, the behavioral measures of communication between cooperating partners involve communication quality, information and knowledge sharing and participation (Donaldson and O'Toole, 2007, p. 150-151). According to Cousins, Lawnson and Squire (2008, p. 244), the communication performance measures are the following: effectiveness of communication, information exchange, information quality and timeliness and the level of feedback from the relationship partner.

As far as communication quality is concerned, it is necessary to focus on accuracy, adequacy, timeliness, completeness and credibility of shared information. It is indisputable that the quality and intensity of the information shared by partners highly influences the strength of the relationship. As highlighted by Mohr and Spekman, the higher is the quality of information sharing and the more intense it is, the more likely is that a relationship will be stable and developing (Mohr and Spekman, 1994). Also, cooperators' participation in several aspects of the relationship communication system improves the closeness of the partnership and strengthens partners' mutual trust.

Here it is important to say that most authors point out that the quality as well as quantity (frequency) of communication between cooperating firms on one hand stimulate the emergence of inter-firm trust, because due to mutual understanding it makes it easier to predict each other's behavior. But on the other hand communication, to flourish, communication requires the foundation that is a particular level of inter-firm trust (Sako, 1992, p. 126-133; Borch, 1994, p. 113-135; Sydow, 2000, p. 48).

While discussing the nature and the role of communication within inter-firm relationships the present-day approaches concentrate also on the issue of conflict resolution. Conflicts between partnering companies may occur as a natural result of intensive cooperation and desire to accomplish their own goals. The abilities to handle such conflicts in an efficient and effective way is needed to maintain successful cooperation and therefore collaborative learning. The system of conflict management should be involved into communication system set up for a particular relationship. It should enable managers and employees of partnering firms to gather information, understand the context and then participate in the decision making process enhancing their capacity to deal with a conflict before it escalates (Zineldin,

2004, p. 780-789; Parung and Bititci, 2006, p. 125; Chin, Chan and Lam, 2008, p. 445).

Concluding, the communication system that enables the effective sharing of information needed for the relationship goals implementation, is an important factor fostering partners' trust which sometimes is conceptualized as a communicative, sense-making process that bridges disparate groups (Zuker, 1986; Sabel, 1993). It has been recognized that such communication systems significantly reduce the level of uncertainty perceived by cooperators, especially in the new situation which is the establishing of an inter-firm relationship aimed at collaborative learning.

Commitment

Collaborators' commitment is defined as their conviction that the relationship is beneficial for them so they are eager to undertake different activities in order to sustain it and assure the stability and efficiency of a relationship (Barry, Dion and Johnson, 2008, p. 119). While discussing the nature of relationship partners' commitment, it seems necessary to point out three dimensions of commitment which are typical of inter-firm learning relationships. Those dimensions involve operational commitment, information commitment and investment commitment. The first of above mentioned, operational commitment, refers to cooperating companies' shares in the common venture. It is indisputable that the more investments the partners make, the more attention they will pay to the usage of invested resources as well as to the cooperation outcomes. Information commitment is the second dimension of partners' commitment. In general, it concerns the communication between cooperators. In particular it refers to the type, frequency, forms of inter-firm communication and the way that partners apply gathered information. What is significant, practitioners underlie that this dimension of partners' commitment refers mainly to the honesty while sharing information with a cooperator. Due to its character, the information dimension of commitment appears as an essential condition for the development of knowledge-creating relationship. The third of above mentioned, that is the investment dimension of commitment, concerns resources allocated by relationship partners (Czakon, 2007, p. 82-83).

Among pertinent issues regarding the commitment within a business relationship, there is a necessity for underling the importance of mutual trust between partners. According to the research conducted by Walter, Mueller and Helfert on a group of 230 inter-firm relationships, trust as well as relationship value, are powerful predictors of relationship partner's commitment (Walter, Mueller and Helfert, 2014). If cooperating firms trust

each other, they show a higher level of eagerness to share their strategic resources, such as knowledge. Moreover, if the relationship is characterized by a high level of mutual trust, the partners find any investment they make in cooperation as being less risky. What is more, while the commitment of the firms that have established a particular relationship increases over time, it restricts the risk of partners' opportunistic behaviors. Such a positive change results from the fact that cooperating companies have already allocated some valuable resources to set up a cooperation and they steer clear of the loses in the case of the relationship breakdown.

A model of the critical success factors for collaborative learning

We propose a model (Figure 1) providing an insight into the interrelations among critical factors for successful collaborative learning occurring in inter-firm relationships. The findings from the literature analysis enabled us to identify the building blocks of the model. We developed the model around the classification of inter-firm learning types and their antecedents identified by Child et al. (2005) and we have made attempts to integrate the extant knowledge in the area of study. We were especially inspired by the streams of literature on absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002; Todorova and Durisin, 2007; Sun and Anderson, 2010) and the elements of inter-firm positive potential such as: relationship governance mechanisms (Mohr and Sengupta, 2002, Child et al., 2005) trust (Hardy et al., 2000; Child, 2001, Heffernan, 2004), inter-firm communication (Chin et al., 2008; Cousins et al., 2008) and commitment (Barry et al., 2008, Chin et al., 2008). In our approach we purposely separated learning prerequisites from learning enhancers. We assume that factors which determine decisions to establish inter-firm learning partnership are different from those which motivate partners to sustain their relationship.

In our model, success in collaborative learning is understood as accomplishing the agreed relationship goals that partners set up for a particular relationship in quantifiable terms (Jap, 2001; Child et al., 2005, p. 194). Consequently, this should result in the increase in cooperating firms' innovativeness. Successful collaborative learning includes both acquiring knowledge that is completely new to a firm or/and common creating of new knowledge. Such knowledge becomes a valuable strategic asset for both cooperating companies. Moreover, successful collaborative learning means that relationship participants maximize desired learning while at the same time minimize undesired learning. This aspect seems to be of significant importance due to dyadic nature of inter-firm learning. To be successful and therefore satisfied with the learning oriented relationship, cooperating

companies have to include protection against partner's accessing their own propriety information.

Figure 1. Critical success factors for collaborative learning
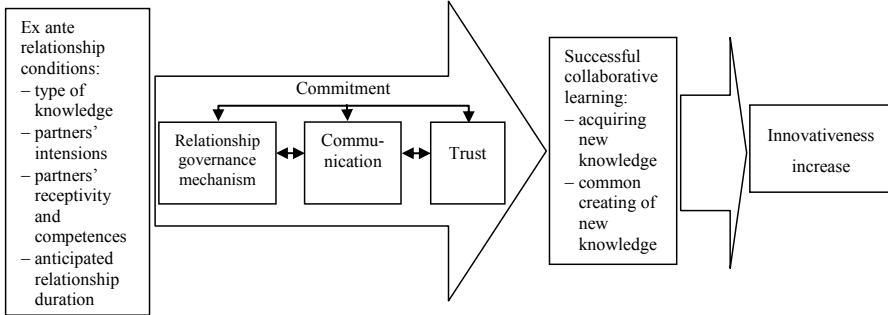
The starting point for the model is composed of ex ante relationship conditions that include partners' intentions, their receptivity to new knowledge as well as their competences in knowledge assimilation and anticipated relationship duration. As the critical factors determining the success of inter-firm cooperation focused on creating knowledge assets the model points out specific governance mechanisms designed to coordinate and control relationships, mutual trust between relationship partners, an effective communication system within a relationship and the development of the relationship. All aforementioned variables are included into another significant factor that is relationship partners' commitment.

Ex ante relationship conditions are necessary to establish the minimum level of calculative trust in order to enter into such an inter-firm learning relationship (cf. Child, 2000; Child, 2001). The nature and importance of trust has been discussed earlier in the paper. It is necessary to note that trust between cooperating enterprises creates the foundation for effective information and knowledge exchange. If partners trust each other, they are more willing to deliver appropriate and valuable information and knowledge that are needed for cooperation. This exchange in turn increases the level of mutual trust between partners. Moreover, trust evolves and changes its character, from calculative to cognitive. Another critical factor for successful collaborative learning presented in the model is setting up proper governance mechanisms for a particular relationship. a high degree of trust, combined with effective and satisfactory communication system as well as

proper governance mechanisms entail high degree of partners' good will and commitment to common activities and objectives.

The core issue for the proposed model is combining the above described elements and understanding interrelations that exist among them. It is indisputable that a high level of mutual trust, communication based on this trust, control procedures as well as partners' commitment are all necessary to share valuable strategic assets, e.g. knowledge. Therefore the combination of those variables fosters the process of collaborative learning. What is also of significant importance, the presented model is of dynamic character that means the state of its elements is changing over time. The knowledge concerning the significance and the impact of above discussed factors on the success in collaborative learning enables managers of cooperating firms to create intentionally the conditions fostering the increase both in enterprises knowledge base and their ability to create innovations.

We acknowledge the fact that developing a model of successful collaborative learning for company innovativeness is a very ambitious and challenging aim. Recognizing the significant role of absorptive capacity for inter-firm learning, the challenges related to developing such a capacity should be considered. Overlooking the potential of new knowledge or being unable to understand it is one of the risks. Another problem is the failure to distinguish between knowledge which can be easily attached to existing knowledge structures (knowledge assimilation) from knowledge which requires the change of organizational knowledge structures in order to enable knowledge transformation. Moreover, contingent factors such as social integration mechanisms, regimes of appropriability and power relationships should be taken into account. Finally, the effectiveness of the feedback loop between absorptive capacity and the company knowledge base needs to be considered (cf. Todorova and Durisin, 2007). The issues discussed above are only the example of the variety of barriers and challenges connected to the building blocks of a model of critical success factors for collaborative learning. Being aware of these challenges we recognize the need for further studies in the area in order to investigate thoroughly the aforementioned challenges and to apply them to test our model.

Conclusion

Summing up, we assess that all the paper objectives have been reached. The problems of the structural conflict between competition and collaboration occurring in inter-firm learning partnerships have been analyzed. Inter-firm learning relationships have been defined and characterized. Then, the ex ante conditions of successful collaborative learning and the intra-organizational

enhancers of inter-firm learning processes have been identified and studied. Finally, a model of the critical success factors for collaborative learning has been developed.

Nevertheless, we are aware that the identified critical success factors for collaborative learning require further research in order to study them thoroughly. First of all, the barriers and challenges related to the components of the model need to be studied thoroughly. Then, in our opinion, the relationships between ex ante conditions and collaborative learning enhancers are the issue of predominance importance to be investigated. Moreover, the cohesion of the aforementioned constructs and the mutual relationships between their elements need to be explored. Further research activities within the field should be aimed at measuring the strength of these relationships and identifying cause-effect relations in order to provide managers with recommendations necessary to build up the potentials of their companies to participate successfully in inter-firm learning partnerships.

Acknowledgements

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Abstract (in Polish) - only for Polish authors

Text: *Celem artykułu jest zbudowanie modelu kluczowych czynników sukcesu dla procesów kooperatywnego uczenia się zachodzących pomiędzy współpracującymi przedsiębiorstwami. Po pierwsze, w artykule przedstawiono istotę międzyorganizacyjnego uczenia się koncentrując się na zagadnieniu kooperatywnego uczenia się. Po drugie, rozważaniom poddano problemy relacji międzyorganizacyjnych ukierunkowanych na wzajemne uczenie się. Po trzecie, zidentyfikowano i opisano czynniki niezbędne ex ante do zaistnienia efektywnych procesów międzyorganizacyjnego uczenia się oraz uwarunkowania wewnątrzorganizacyjne stymulujące te procesy. Ukoronowaniem rozważań jest zaproponowany przez autorów model opisujący kluczowe czynniki sukcesu procesów kooperatywnego uczenia się zachodzących pomiędzy współpracującymi przedsiębiorstwami.*

Keywords: *innowacyjność, międzyorganizacyjne uczenie się, relacje międzyorganizacyjne, kooperatywne uczenie się, kluczowe czynniki sukcesu kooperatywnego uczenia się.*

Biographical Note

Agata Sudolska, Ph.D. is an Associate Professor at the Faculty of Economic Sciences and Management, Nicolaus Copernicus University, Toruń. Her area of interests and research activities encompasses the issues of the process of creating innovations as well as managing inter-firm relationships

and networks, in particular with the focus on knowledge exchange and collaborative learning.

Andrzej Lis, Ph.D. is an Assistant Professor at the Faculty of Economic Sciences and Management, Nicolaus Copernicus University, Toruń and a staff officer of the Doctrine and Training Centre of the Polish Armed Forces, Bydgoszcz. His area of research activity encompasses the issues of knowledge management, change management, defence industry and military logistics, whereas the main research interest is focused on Lessons Learned processes.