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ABSTRACT

Role of intermediaries and innovation systems performance

Knowledge has become a fundamental resource for production; a major element for the innovation and the competitiveness of firms, cities and nations. Firms cluster to benefit from the local learning and knowledge flows resulting from the interactions with the others organizations. However the literature shows that the development of clusters occurs mainly in learning regions. Our primary hypothesis is that part of the success of learning regions comes from the existence of the diverse social actors as business communities that organize sharing activities on a regular basis. Among these actors, we find what we call intermediaries (for example industrial or professional associations, chambers of commerce, community organizations, venture capital organization) that contribute to the creation and the support of social dynamics within the networks of innovations.

The study of the relation between the role of the intermediaries and the performance of the systems of innovation are relatively limited in the innovation literature. Some studies are only conceptual and sometimes try to identify these intermediaries and to describe in a theoretical way their role in the innovation process, while others show that these roles differ according to the macro, micro or meso level. In our presentation and article, we consider the role of the organizations on the meso level. The principal aim of this study is to investigate whether the intermediaries' organizations really influence the innovation systems' performance. In this first part of our research, we use the data from the survey of innovation 2003 done by Statistics Canada in order to compare Ontario and Quebec, centering our analysis on the information and communication technologies (ICT) sector, which we will analyse from a qualitative point of view (interviews of actors) in the second part of the research.

Our comparative analysis (Quebec and Ontario) of the role of the intermediaries and their impacts in the innovation process shows that the intermediaries have a positive impact on the performance in product and process innovation in the ICT sector. This positive effect seems to be more due to the role of the industrial associations. Our presentation and article will thus present the first step of our research, which will be followed by an analysis of the sectoral differences in Quebec by using the Quebec census innovation data (2005) of Statistics Canada (request for access in the ISQ is in process), and by qualitative analysis of actors in the ICT sector.

Introduction

Knowledge has become a fundamental resource of the production in the economy; a major element for the innovation and the competitiveness of the firms, the regions and the nations. This knowledge is available through the interactions between firms themselves and also with others organizations. That's why clusters of firms have become a current phenomenon in the industrial area. The theoretical contributions that are usually cited in the literature to explain the creation of cluster are based either on the concept of "industrial districts" introduced by Marshall, or on the competitiveness of local industries developed by Porter (1990) with his study on the competitiveness of the nations or on the concept of "Milieux innovateurs" from the Groupe de Recherche Européen sur les Milieux Innovateurs (GREMI);

For Marshall, as the large factories are less effective and less flexible, then it is necessary to divide the production process into several parts that can be done by small specialized firms. These firms can be grouped in a geographical area in order to facilitate their collaboration. The result of this agglomeration is the "cluster" or the "industrial district" and allows the firms to benefit from externalities like reducing cost of production, availability of the infrastructures, the services and knowledge.

Porter explains the cluster phenomenon by the needs for the firms, regions and nation to remain competitive in order to survive in the economy. The firms agglomerate in cluster because this is a strategy which will enable them to profit from competitive advantages in particular by increasing their productivity and their ability to innovate. However, it is necessary to have a good environment (political, legislative and economic environment), specialized high quality resources (capital, labour, infrastructures and natural resources), a good local market (in term of quality of

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consumers) and finally the availability of suppliers. This approach also include the product differentiation as a mean of competitiveness instead of limiting it to cost reduction as Marshall did.

The approach of «Milieu innovateur» uses the territory or the «Milieu» to explain the cluster phenomenon. The GREMI defines the “Milieu” as a group of relations that occurs in a geographical area with a system of production, a specifically culture and actors. (Maillat et al.; 1993; p. 4). In this approach, the cluster is the result of the «milieu». It develops because the «milieu» allows networks that create interdependences and cooperation between the different actors. This «milieu innovateur» approach can be integrated in the innovation system approach (Freeman (1987), Lundvall (1992), Nelson (1993), Edquist, (1997, 2001), Edquist & Jonhson, (1997)) and the cluster can be considered as a microsystem of innovation or reduced-scale national innovation system (Roelandt and den Hertog, 1999).

The literature on the systems of innovation is various according to the limits that could be national, local, sectoral or technological. However, some authors introduced the concept regional system of innovation (Asheim & Gertler (2003) and Cooke 2001, 2004) and the concept of learning region (Florida, 1995) in order to show the important role of the region in the innovation with the localised learning process. And, the literature shows that the microsystems of innovation or clusters appear particularly in the learning regions. Then, we postulate that these learning regions are successful in innovation because they have a diversity of social actors like business community that use to collaborate together. Among these actors, we find the intermediaries like industrial associations, government agencies, research institutions and venture capital organizations. At the regional level, these organizations contribute to the creation and the support of dynamics within the networks of innovations.

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However, in our knowledge, very little research has been done on the relation between the role of the intermediaries and the performance of innovation in the microsystems. One part of this literature has tried only to identify these intermediaries and to describe in a theoretical way their role in the process of innovation, while the other one has shown that these roles differ according to the macro, meso or micro level. In this article and communication, we consider the role of the organizations on the meso level and we do a comparison between Ontario and Quebec in order to investigate whether the intermediaries really influence the performance of the microsystem of innovation which is the cluster. To be able to do that, we use the survey of innovation of Statistics Canada (2003) and we focus on the information and telecommunication sectors (ICT).

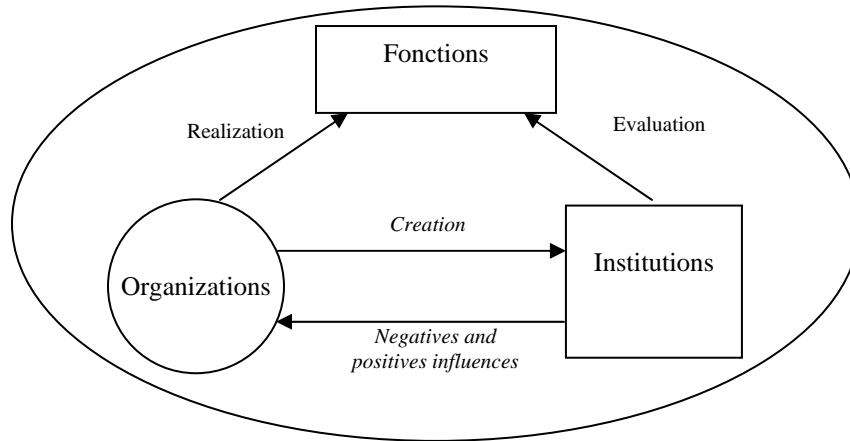
Our comparative analysis (Quebec and Ontario) of the role of the intermediaries and their impacts in the process of innovation shows that these organizations might have a positive impact on the performance of the microsystem in product and process innovation. But, this seems to be more the effect of industrial associations. This first step of our thesis will help us in the second step, with the innovation data of Statistics Canada (2005) to measure the sectoral differences in Quebec knowing that a complete census of the manufacturing companies was done in this region (our request for access to the data is in process in the Institut des Statistiques du Québec (ISQ)). However, this first stage allows us to conclude that in this ICT sector at least the proximity and the exchanges between actors contribute to the product and process innovation.

Role of the intermediaries and the performance of innovation systems

In the literature on the innovation systems, the system is either delimited by considering only the organizations which intervene directly in the process of innovation or with the integration of all economic and institutional structures that intervene or influence the process of innovation. The institutions are the common practices, the routines, the established practices, the rules or laws which control the relations and interactions between individuals, groups and actors (Edquist and Johnson, 1997: 47). In this paper, we consider only the organizations that participate in the innovation process. Moreover, as the firm don't innovate alone, we take in account the learning interaction in the process. The organizations and the institutions are the components of the innovation system where three relations (Edquist, 2001) could be found.

These relations can be between the organizations, the organizations and the institutions or the institutions. Two organizations could have a market or non-market relation. The non-market relation usually allows to exchange for example tacit knowledge that is not available with market transaction. The relations between the organizations and the institutions are another type in the innovation system. The organizations fulfill different functions in the system that can be used by the institutions to evaluate them even if these institutions are created by the organizations (see figure 1). There is also a last type of possible relation which is between institutions.

Figure 1 : Microsystem of innovation



In this paper, we evaluate the microsystem in the ICT sector in two ways. First we base our performance evaluation on the availability of the essential resources for the innovation. To be able to do that, we use the theoretical concept of the technological regimes (Nelson and Winter, 1982). A technological regime is based on opportunities and appropriability conditions, the accumulation of knowledge and the characteristics of the knowledge base (Malerba and Orsenigo, 1990, 1993, 1997). The opportunities conditions determine the probability of the firms to innovate. Opportunities include the presence of sources of innovation such as the universities or research laboratory and an intense research and development.

The appropriability conditions are the possibilities of protecting the innovation from the imitation. Moreover, we integrate the tacit knowledge which is particularly essential for the innovation and which is an embodied knowledge. As the competences become also important for the innovators then the availability and the retention of competences or talents (Florida, 2002) is essential to allow the firms in the microsystem to innovate. To sum up, we consider in this paper that innovation in the microsystem relies on the opportunities and appropriability conditions, on the competences and the institutional environment. Therefore we make the following proposals:

Proposal 1: The performance of the microsystem of innovation depends on opportunities and appropriability conditions.

Proposal 2: The performance of the microsystem depends on the availability of competences, the interactive learning and the institutional environment.

As said above, the organizations that are in the microsystem of innovation realize some activities which are the functions of the system. Then, our second way to evaluate the performance of the microsystem is to see whether these functions are fulfilled correctly. The principal activities that are realized by the organizations include the supply of necessary resources for innovation (Johnson et Jacobsson; 2000)¹ and this is shown in the literature. A first group of researchers considers that these organizations, particularly the intermediaries play the role that consists in information diffusion, on technology transfer and giving different kind of support to the firms while another group asserts that the principal role of intermediation is to fulfill the function of collecting, analyzing and communication of the information (Howells 2006).

The diffusion and the technology transfer include the following activities: transmission of information, support in the decision-making, evaluation of new technologies, identification of the partners, technology transfer etc. Finally the intermediaries support the firms in adapting the innovations to their specific needs, in being able to keep relations between the actors of the technological system, and contribute to the development of public policies.

¹ Cited in The Systems of Innovation Approach and Innovation Policy: An account of the state of the art By Charles Edquist Lead paper presented at the DRUID Conference, Aalborg, June 12-15, 2001.

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Smedlund (2006) associates the role of the intermediaries to the regional dynamics which is defined as: “The networks of production, development and innovation ...”. Dynamics constitutes tangible and intangible flows within the region that is not possible without the networks and their interactions. For Smedlund, the intermediaries contribute to the creation and the support of dynamics within the networks because they help in the formation of strategies of innovations between the actors, the attraction and the retention of large firms with high intensity of Research & Development. The case study that was done by Tremblay and Al (2002) on the City of Multimedia in Montreal illustrates well these roles². Finally, the intermediaries stimulate the social dynamics which allows the creation, the evolution and the development of the microsystem; because they support the diffusion of the information and the improvement of the knowledge base of the firms, the availability of competences and the continuous learning through interactions. Then, we make the following additional proposals:

Proposal 3: The intermediaries have a positive impact on the opportunities and appropriability conditions

Proposal 4: The intermediaries have a positive impact on the availability of competences, on the learning and the institutional environment.

Proposal 5: The intermediaries have a positive impact on the performance of the system (consequence of proposals 3 and 4).

These proposals will be tested thereafter in our case study.

² Diane-Gabrielle Tremblay, Juan-Luis Klein, Jean-Marc Fontan, Danièle Bordeleau (2002) Modalities for Establishment of the Relational Firm: a Case Study of the Cité du Multimédia, Montreal Collectif de recherche sur les innovations économiques, sociales et territoriales (CRIEST)
Roelandt, T. and P. den Hertog (1999) “Cluster Analysis and Cluster-based Policy Making: The State of the Art”, in OECD, Boosting Innovation: The Cluster Approach, OECD, Paris, pp. 413-427

Case study: Case of Quebec and Ontario

The ICT sector is one of the most important parts of the Canadian national economy. It contributes significantly to the GDP and is also an important source of jobs. The proof is that during 1977 to 2000, its part of the GDP increased by 19% compared to 5.1% for the whole Canadian companies³. Moreover, in 1999, this sector creates 3.9% of the jobs in the whole economy. According to Canada Statistics⁴, the sub-sector of the services is more dynamic than the manufacture one in the ICT industry. The growth of the sector of the ICTs was primarily due to the services during 1997 to 2003 when its part of the GDP passed from 3% to 4.6% compare to the manufacture subsector which passed from 1% to 0.8%. At the provincial level, Ontario and Quebec are the most important contributors in Canada, in this sector with the incomes generated (respectively 40,1% and 24,7% of the incomes in 1999). That's why we chose these two regions for our comparative study.

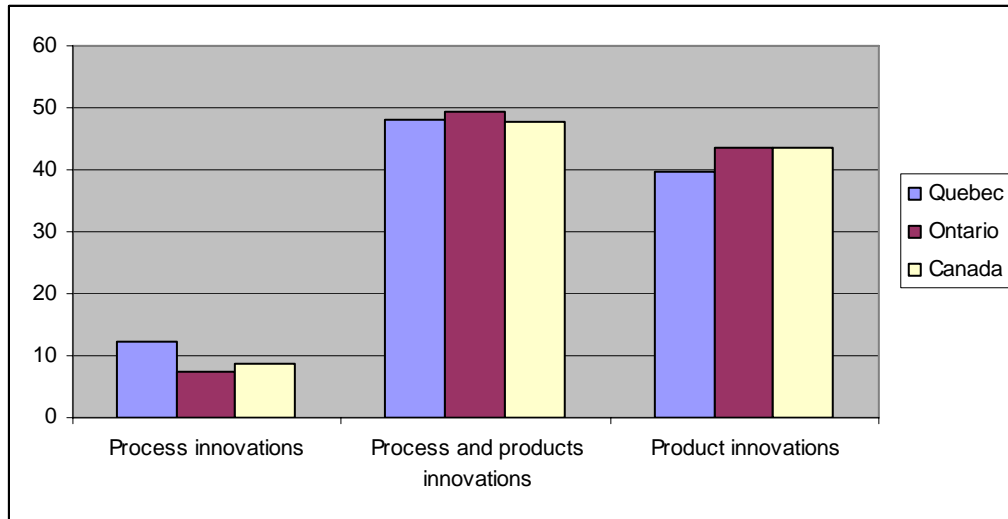
Our research is based on the innovation data 2003 of Canada Statistics in the ICT services industry. The questionnaire was based on the indicators recommended in the Oslo Manual. The sample was built by considering only the establishments which have 15 employees or more and 250000 \$ of incomes. Therefore, on a population of 4504 companies in the sector of the services, the sample concerned 1359 establishments. In this survey too, the establishments which are innovators are those that have introduced a new product in the market or have improved their process or built a new one during 2001 to 2003. We do a comparative analysis of Ontario and Quebec in order to try to explain why a microsystem in a particular region perform more than another one. In our case the analysis of the performance in product and process innovation shows

³ Statistiques Canada, Coup d'œil sur le secteur des Tics, DSIIIE, page 190.

⁴ Statistiques Canada, Document de travail ; Innovation dans les industries de service du secteur des technologies de l'information et des communications (TIC) ; résultats de l'enquête sur l'innovation 2003. par Charlene Lonmo, Division des sciences, de l'innovation et de l'information électronique (DSSIE), N°88F006XIF au Catalogue – N°12. ISSN : 1706-8975. ISBN : 0-662-74845-X, Page 12

that Ontario performs slightly better than Quebec in product and process innovation (see figure1). What explain this lag of performance? That’s what we will try to explain in the following sections.

Figure 2: Type of innovation by region



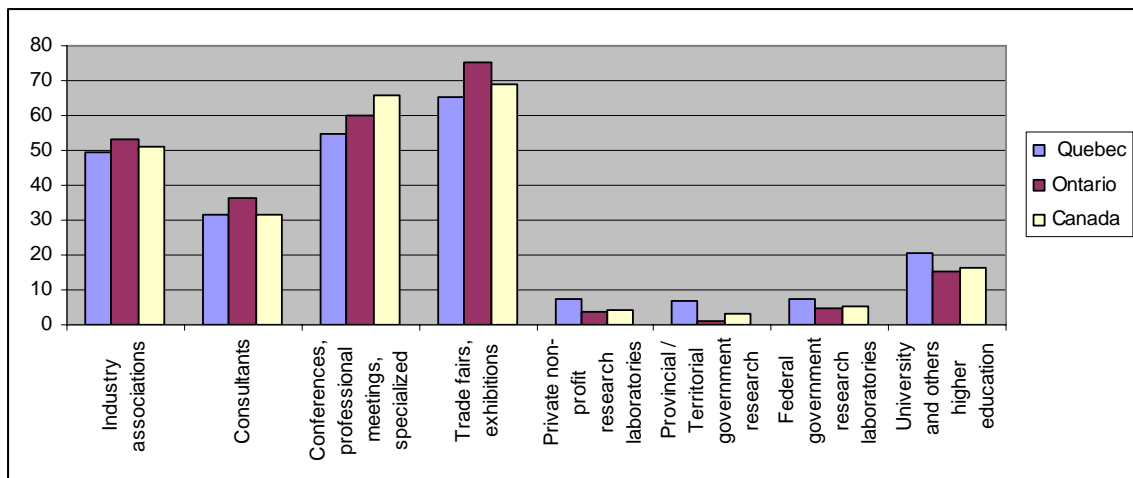
To be able to do that, as said before, we will evaluate the microsystem by analyzing mainly the opportunities and appropriability conditions. To these opportunities, we add the availability of competences and possibilities of learning. To the conditions of appropriability, we add the regulation environment. In the next sections, we will test our proposals. In the first part, we will analyse the conditions of innovation in order support our proposals 1 and 2 and this part too will be useful in complement of the second part to support our proposals 3, 4 and 5. In the second part, we will determine the role of the intermediaries on the performance of the microsystem. We will try to find out how the intermediaries realize activities or participate in the innovation process and consequently in the performance of the microsystem. This second part will allow us to support our proposals 3, 4 and 5.

Conditions of innovation

a. Conditions of opportunities

The figure 3 shows that the sources of information that are most used by the innovators are the trade fairs and exhibitions, the professional congresses and conferences, the business associations, the consultants. For all these sources of information, figure 3 shows that the percentages are higher in Ontario. Therefore, it is possible to predict that the advantages might be more important in Ontario in term of the exchanges and the availability of information for the innovation. Consequently, this can be a first explanation of the disparity between Quebec and Ontario in product innovation.

Figure 3: Organizations used as source of information for process and product innovation



In the knowledge economy, the availability of high level competences and the possibility of improving these competences and of increasing the firm knowledge base in a continuous way with the training is essential for innovation and competitiveness. The regions which have a quality human infrastructure have competitive advantages because they are attractive for the firms

and in addition because they are a favourable milieu for innovation (Florida, 1995). Figure 4 shows that Ontario has higher competitive advantages than Quebec in term of availability of high quality competences; As the data show there is more employees with a university diploma in Ontario than in Quebec. This can be explained by the fact that Ontario seems to focus more on hiring skilled workers, on the creation of incentives to attract them or to retain them (see figure 5).

Figure 4: Availability of competences for process and product innovation

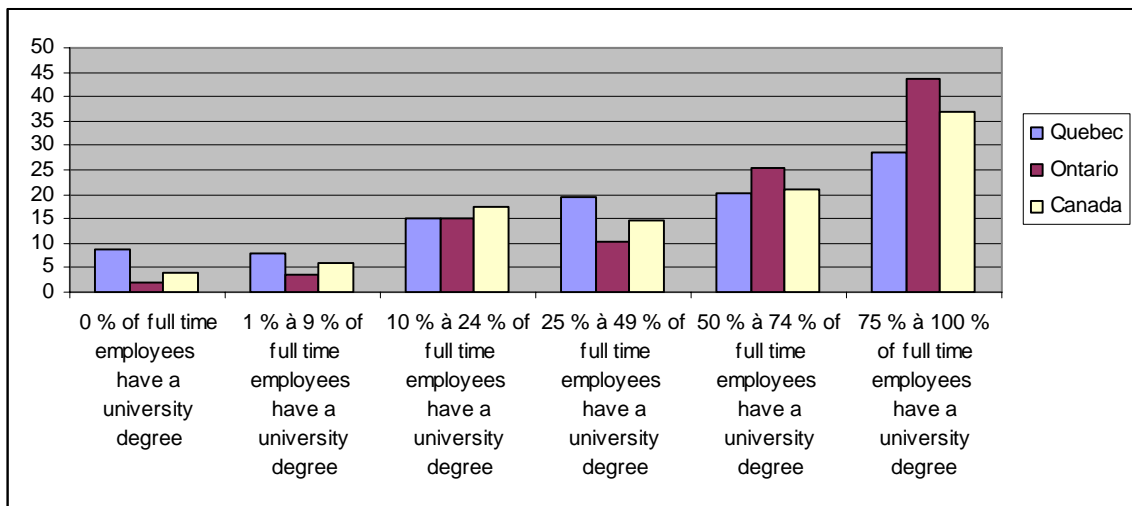
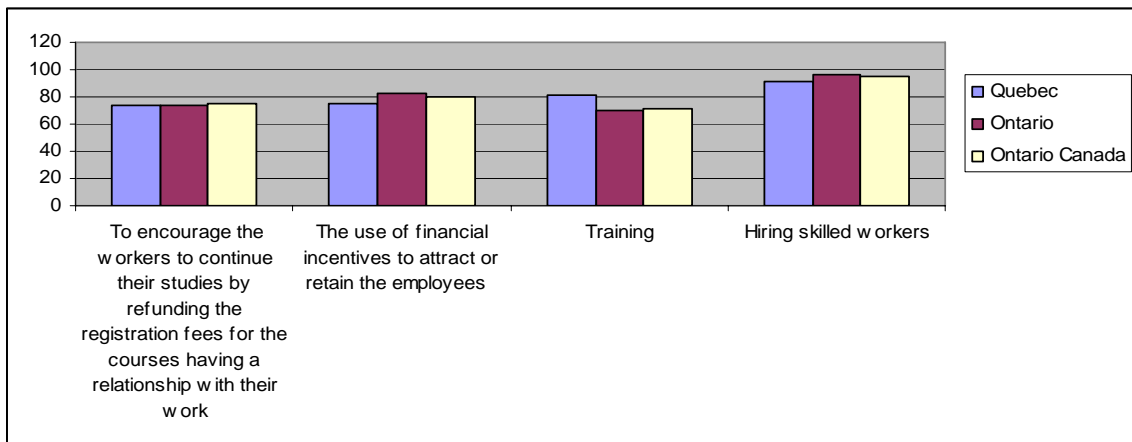
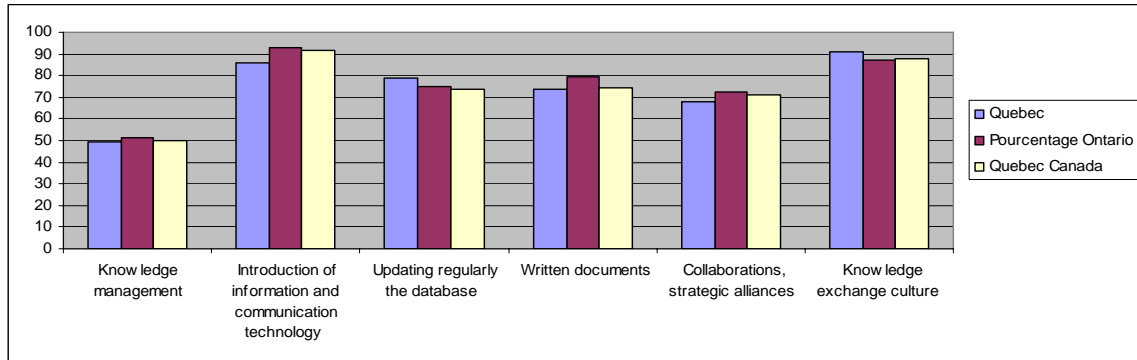


Figure 5: Success factors (Medium to high importance) for process and product innovation



This availability of competences helps with the knowledge diffusion through learning which results in the interactions between employees but also with self-training. From this point of view, figure 6 shows that in Ontario as in Quebec different methods are used for that.

Figure 6: Success factors (medium to high importance) for process and product innovation



B. Conditions of appropriability

The method of protection which is most cited in Ontario as in Quebec is the confidentiality agreement. The proportion is slightly higher in Ontario (see figure 7); however, that shows the need for interaction as a mean the diffusion of the information. This could be the consequence of lack of industry wide standards or government standards and regulation. This seems to be the case in Quebec and in Ontario but in a higher proportion in Ontario if we take in account the proportion of innovators which consider this phenomenon as an barrier or obstacle for innovation (see figure 8).

Finally, our analysis shows that the conditions of innovation are more favourable to the performance of the microsystems in Ontario. The opportunities help to have a best availability of the sources of innovation and competences while the appropriability conditions allow the interaction for the exchange of tacit knowledge; this knowledge which is more vital for the

performance of the microsystem. This analysis seems to show that our proposals 1 and 2 are supported.

Figure 7: Methods of intellectual property protection

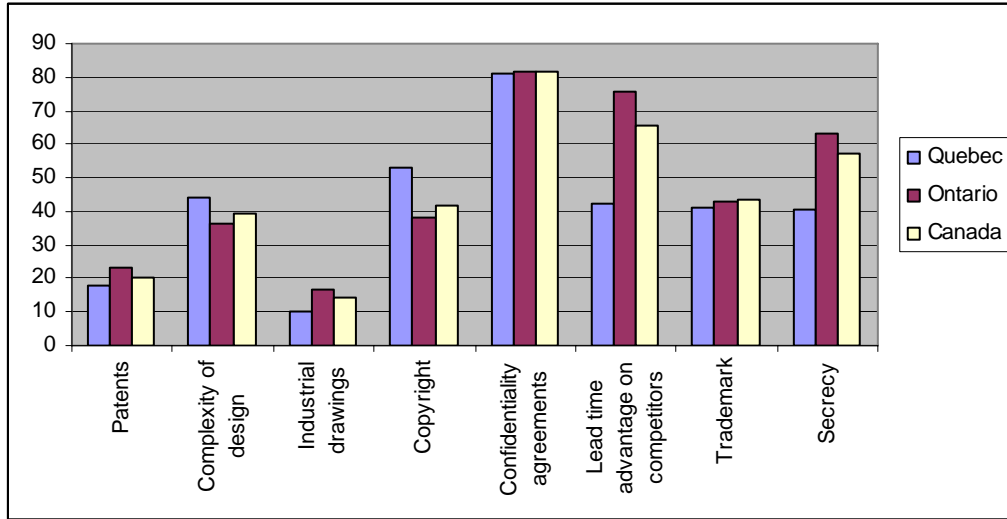
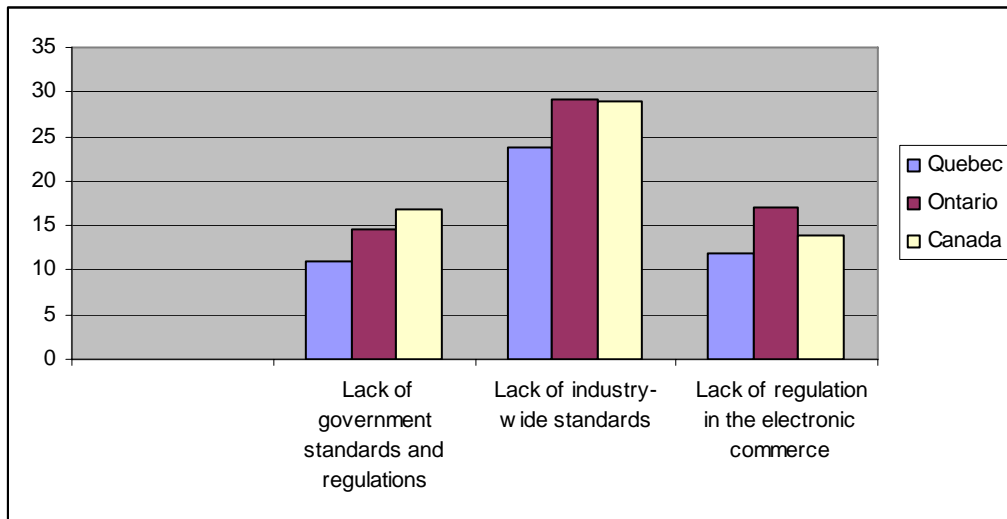


Figure 8: Obstacles (Medium to high importance) for process and product innovation



Impact of the intermediaries

Figure 9 shows that the success in innovation is related to the proximity of the universities and research laboratories as well as the presence of local and regional industrial associations. Dutriaux (2003) did an investigation on the role of the universities in the development of the clusters in Canada in the high technology industry. His study was based on the analysis of 11 clusters that are the most dynamic in Canada high technology during 1980 and 1990. He showed that the universities are important catalysts of creation and development of firms in the high technology sector. Moreover, they participate in the construction of the local knowledge base that allows the clusters to develop and to grow.

Dalziel (2006), by using the Statistics Canada innovation data (2003) showed that industrial associations play an enabler role in innovation and have an important impact on the ability of the Canadian firms to innovate. Here, figure 9 also shows us that industrial associations are intermediaries which contribute more to the success of innovation. By considering the important role of these industrial associations, it seems that Ontario profits from it more than Quebec as the data show it in figure 9. The venture capital organizations participate in innovation because they finance the innovation projects. The governmental organizations also take part in the innovation but however this seems to be more efficient in the research and development tax credits (see figure 10). However, Quebec uses more the governmental assistance than Ontario for research and development.

Figure 9: Success factors (medium to high importance) for process and product innovation

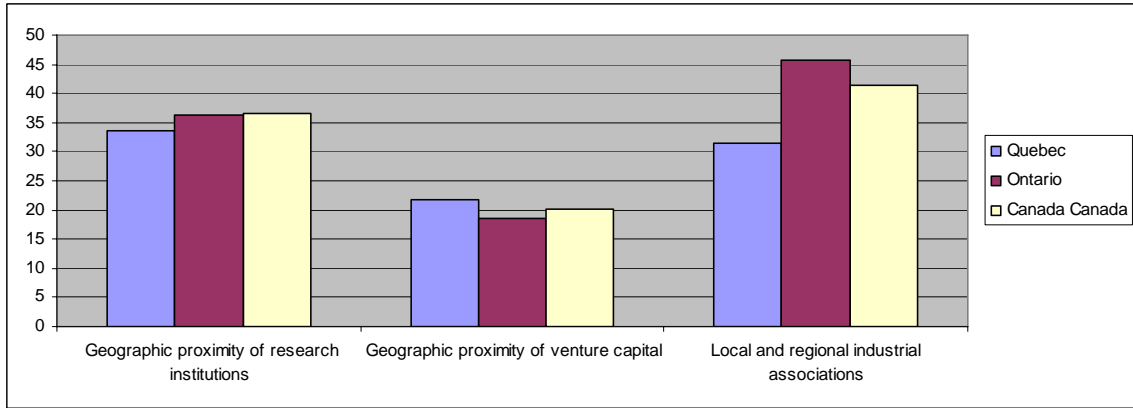
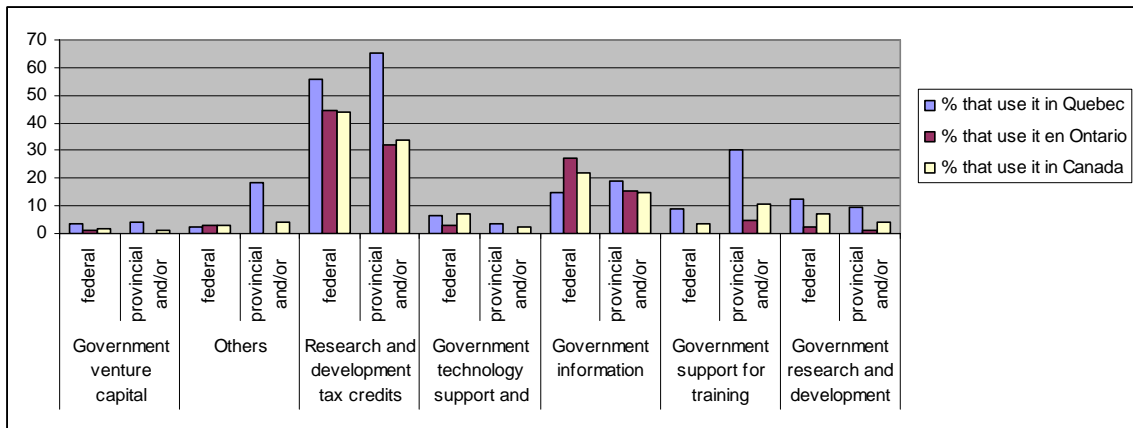


Figure 10: Use of the governmental assistance



It appears that the intermediaries take part in the process of innovation in various manners. It seems that industrial associations might have more impact on the performance of the microsystem if we consider the data and the empirical studies cited above. It is possible to predict that this impact will be more important in Ontario because of the proportion of innovators which consider it as a success factor in process and product innovation. Then, this could also explain the disparity between Quebec and Ontario in term of the performance of the microsystem. Finally, this analysis

in addition to what said in the previous section presented in the first part allows us to support our proposals 3, 4 and 5. But, it is important to mention that within the role of all intermediaries, the specific role of industrial associations seems to be very important.

Conclusion

In this article, we've tried to determine the intermediaries' role on the performance of the microsystem of innovation. Our main objective was to investigate whether the intermediaries have an impact on the performance in product and process innovation of the microsystem in the ICT sector. We made five proposals which we tried to test with our case study carried out with the survey of innovation done by Canada Statistics in the ICT sector in 2003. We showed that these intermediaries create the dynamics within the microsystem et consequently support the innovation activities. Therefore, they influence the opportunities and appropriability conditions, the availability of competences and the learning, and finally the regulation in this environment.

To sum up, this analysis which is the first step of our research show that the intermediaries might have an impact on the performance in product and process innovation in the microsystem. However, the industrial associations seem to contribute more in this performance. This conclusion goes in the same direction as some empirical studies carried out on the role of the intermediaries in the literature on the innovation. However, the nature of the innovation data that we used does not enable us to go in-depth in our analysis particularly to determine the qualitative aspects. That's is why, in the second part of our research, we will carry out interviews with the actors of the microsystem in order to understand more the role of the intermediaries and their impact on the performance of the microsystem of innovation.

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