

Is regional innovation system development possible in peripheral regions? Some evidence from the case of La Pocatière, Canada

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The aim of this paper is to contribute to a greater understanding of the research on innovation systems in peripheral regions by providing a detailed account of the case of the La Pocatière region in Canada. In analysing this case, we raise the following two questions: (1) what are the actors and structure of the innovation system in La Pocatière?; (2) what are the key factors and dynamics leading to innovation activity, as well as to the transformation and growth of this regional innovation system? The empirical bases for the analyses are derived from various sources: historical documents, statistical data, and in-depth interviews with key individuals in private and public organizations.

Keywords: regional innovation system; peripheral region; innovation; network; institutions; La Pocatière, Canada.

1. Introduction

In the literature, much attention has been devoted to analysing regional innovation systems (RIS) in core regions and knowledge-intensive sectors. This is partly justified by the fact that the basic conditions and stimuli for innovation are mainly found in or near core regions, which remain better equipped in terms of relevant actors, knowledge and support organizations, specialized resources, skills and competencies (Cooke 2002, Asheim and Gertler 2005). As a result, the RIS approach has been mainly employed as an analytical concept and tool to explain the regional pattern of technological development in core regions, as well as in other well-known learning regions (Benner 2003).

Thus, most studies on RIS tend to concentrate on a limited number of configurations, always in urban areas with high population density and high levels of industrialization. However, it is not self-evident that such studies can contribute to our understanding of regions that do not exhibit these features. As stressed by Montana *et al.* (2001: 9):

The capacity to innovate is not just for technology hot spots like Boston, Austin and Silicon Valley. It is relevant to any region that sees the importance of building the capacity for continuous reinvention, which is needed to keep pace in today's rapidly changing world. Since no community – rural or urban – is immune from the forces of the global economy, it is important to explore the different ways to build this capacity.

It is often argued that it is difficult to develop innovation systems in peripheral and rural regions because of the absence of sectors that have technological complementarities, and the lack of relevant regional actors in a critical mass and sufficient density (Malecki and Oinas 1999, Isaksen 2001, Tödting and Trippel 2005): in other words, these regions would have few prospects for development and growth because they do not have the capacity to build an environment that can stimulate innovation and technological activity.

This paper aims to contribute to a greater understanding of innovation systems in peripheral regions by providing a detailed account of the case of La Pocatière in Canada. Here, a small institutional and educational community is performing relatively well, despite its small size and its location in the periphery of Quebec Province. In addition, this region is characterized by a long-standing tradition of innovation in agronomics and agricultural activities, and more recently in transport and engineering technologies. In analysing this case, we raise the following two questions:

1. what are the actors and structure of the innovation system in La Pocatière?; and
2. what are the key factors and dynamics leading to innovation activity as well as to the transformation and growth of this innovation system?

In the context of our study, we seek to widen the understanding of innovation systems to include peripheral regions. We believe that the relevance of doing so is not simply a question of scientific rigour, but is also based on a social (and political) demand: more than ever, it is now necessary to look more closely at innovation processes and socio-productive transformations in these regions since, like all other regions, they too must set up proactive development strategies so as to convert to the new knowledge economy.

The remainder of this paper proceeds as follows. The next section reviews the concept of RIS, together with debates on innovation systems in peripheral regions. This is then followed by the research methodology and a short description of the La Pocatière region, its evolution and the basic characteristics of its RIS. The section following that will present empirical evidence relating to La Pocatière. The paper concludes by reflecting on the particular characteristics and features of La Pocatière's innovation system and the relevance of the RIS approach to explain innovation dynamics in peripheral regions.

2. Regional innovation systems and theoretical considerations

2.1 What do we know about regional innovation systems in general?

A RIS can be thought of as a concentration of interacting private and public interests, formal institutions, and other organizations that function according to organizational and institutional arrangements and relationships conducive to the generation, use and dissemination of knowledge (Doloreux 2004). In other words, it consists of a knowledge and institutional infrastructure supporting innovation within the industrial structure of a region (Asheim and Coenen 2005). By this definition, the environment of an innovating firm consists of an 'assemblage' of a multitude of actors involved in the innovation process (Lawton Smith 2003). These include other firms,

research institutes, education and training organizations, policy makers, financial organizations, regulatory authorities and intermediary organizations. Moreover, this environment also includes an innovation-supportive culture that enables both firms and systems to evolve over time.

The approach of RIS emphasizes the dynamic, cumulative and social nature of the innovation process and the network of relationships between the structure of production and the institutional setting in which they are embedded (Asheim and Gertler 2005). A RIS consists of two sub-systems (Cooke *et al.* 2004). The first consists mainly of firms in the primary industrial cluster of a region and includes their support industries of customers and suppliers. The second includes the supporting institutions, including the innovation support infrastructure (Hamdouch and Moulaert 2006), and the informal and formal institutions such as the norms, rules, habits and values influencing how innovation is processed and structured in the regional environment (North 1990, Hollingsworth 2000).

The innovation support infrastructure is a central component of the innovation system and is itself made up of three elements (Doloreux 2002, Coenen 2006): (1) organizations that promote the diffusion of technology (science and technology parks) or develop new industrial activities (incubators); (2) the public education system and research organizations such as research and higher education institutes, technology transfer agencies, vocational training organizations, business associations, finance organizations which all provide training, technical and scientific knowledge to the firms; and (3) the regional governance authorities which are public organizations responsible for influencing and supporting the industrial development of the region, and in particular the innovation activity of firms and industries.

The dynamics of innovation systems may also be influenced by informal and formal institutions which include a set of informal rules and a common understanding that facilitate co-ordination or govern relationships between individuals (North 1990). As a social rule system, these institutions provide guidance, allow for routines to develop and ultimately reduce the uncertainty of social interaction (Hollingsworth 2000). Such informal and formal institutions thus reflect and shape the behaviours of the actors within a region and help to develop specific forms of capital that are derived from social relations, norms, values and interactions within the community in order to reinforce regional innovative capability and competitiveness (Cooke *et al.* 2004).

Finally, the approach of RIS highlights the critical importance of the region for the economic co-ordination that triggers innovation and for developing an intensive and interactive network between innovative actors, i.e. firms and non-firm organizations (Asheim and Gertler 2005). In addition, the region enables actors to attract, create and disseminate information by providing the common cultural and social values which facilitate (or impede) social interaction among the different actors involved in knowledge dissemination (Cooke *et al.* 2000).

2.2. *What do we know about regional innovation systems in peripheral regions?*

Current studies on RIS usually focus on highly urbanized metropolitan areas which attained exceptional levels of prosperity with the presence of strong associative and institutional organizations, intensive sharing of knowledge and an important number of knowledge-intensive firms and companies recognized for their strong creativity. It is clear that very few researchers have looked at the extent and the way in which

an innovation system might emerge in peripheral regions, regions which very often do not seem to have the basic conditions identified in the literature as conducive to the emergence of innovation. As a result, less attention has been paid to the contribution of innovation systems in the economic development of peripheral regions, despite the fact that such regions are encouraged to promote technological change and local collaboration in order to become more competitive and innovative.

In contrast to innovation systems in metropolitan areas, there is some empirical evidence suggesting that peripheral regions are *a priori* unfavourable locations for the development and growth of innovation systems. As stressed by Tödting and Trippel (2005) and Isaksen (2001), there is a lack of dynamics, actors and support organizations conducive to innovation and technological change in these regions. They are less developed in terms of the innovation interface backed by the resources and support necessary for networking, training, technological transfer and other knowledge support systems in general. Often, there is an imbalance in science and technology in favour of the public sector, the academic sector in particular (Landabaso and Reid 1999). Moreover, these regions frequently lack specialized services, while there is often a mismatch between the regional supply of innovation and the demand for it (Cooke *et al.* 2000); in addition, co-operation and technology transfer between public R&D centres, universities and the private sector are poorly developed (Doloreux 2003).

Consequently, in peripheral regions, the private sector is often dominated by small companies in traditional industries with little R&D and low absorption capacity, and the levels of innovation are, therefore, frequently lower in comparison to metropolitan regions (Tödting and Trippel 2005). The scope of innovation found in these regions is small-scale, incremental in nature, and it takes place mainly through the application of existing knowledge or through new combinations of knowledge (Asheim and Coenen 2005). Moreover, it is difficult to attract high-skilled jobs to these regions, due mainly to the relative lack of human capital and of agglomeration economies, thus affecting productivity (Morgan and Nauwelaers 1999). Finally, possibility of entrepreneurial growth is limited due to the relative absence of local competition in product markets, the limited scale and scope of local market opportunities, combined with the distance from the largest markets (North and Smallbone 2000).

It is possible to identify what the differences might be in terms of innovation between core and peripheral regions. According to Onsager *et al.* (2007), the difficulty that peripheral regions face in developing dynamic innovation systems can be attributed to three conditions. First of all, as firms do not innovate in a vacuum, innovation is a process based on relations of proximity and is, therefore, intimately linked to and stimulated by the surrounding socio-economic and cultural environment. With favourable conditions, this environment can foster interactive learning capacity by facilitating relations between a firm and the external inputs it requires in order to innovate. Second, the competitive advantage of RIS is determined by the combination of a variety of factors around the beneficial effects generated by the proximity and concentration of actors in a single geographic area. For example, proximity enables and facilitates exchanges between actors in the public and private sectors, as well as reducing costs related to these exchanges (Maskell and Malmberg 1999); geographical concentration provides firms with positive externalities they can exploit;¹ the dense social capital ensures transmission of knowledge and of best innovating practices. Finally, the third condition put forward to explain why a RIS does not develop easily in peripheral regions is the absence of innovation and

cluster dynamics because there is neither a critical mass of actors nor the support infrastructure necessary for the emergence of technological innovation.

Following the works of Nauwelaers and Wintjes (2002) and Isaksen (2001), Tödtling and Trippel (2005) suggest an interesting typology to help understand regional differences in terms of innovation and its role in peripheral regions. This typology identifies three types of regions on the basis of different barriers to innovation. The barriers refer to the variety of obstacles which can hinder the promotion and implementation of innovation processes, as well as hamper interactive learning between private and public actors within a given region. For example, some metropolitan regions are characterized by a fragmentation of the RIS, in particular by the absence of interactive learning between the actors of innovation, even if the said region concentrates an important number of firms and knowledge organizations. Other regions, in the process of industrial restructuring or with an older traditional manufacturing base, can suffer from lock-in caused by over-specialization and by rigidities in the co-ordination of economic activities and innovation networks. Finally, some peripheral regions are characterized by organizational and institutional thinness; this implies the absence or low level of cluster dynamics development, of support infrastructure and of specialized services, all of which are necessary for an effective regional innovation system to function.

Although the types of milieux and regions mentioned by Tödtling and Trippel (2005) correspond to types of barriers that are typical in the context of innovation, not all cases can be fitted within their typology. However, these authors were not aiming to create a typology of regions but of 'innovation barriers', even if one can see that the application of such criteria tends to situate peripheral regions relative to metropolitan regions or even disqualify them altogether from being considered as innovative. As to the arguments relating to the institutional and organizational thinness of innovation systems, they are used despite not being precisely spelt out, thus implicitly relying on criteria corresponding to densely populated and urbanized areas and necessarily setting up comparisons. Nevertheless, some precise types of regions or innovation barriers seem to elude their classification. To quote only two examples: what typical barriers might occur in small institutional towns located in peripheral regions that do not have an obvious industrial past? In addition, what about peripheral regions which have been through phases of development and innovation initiated mainly by public organizations that actually play an active role in regional technological development, despite their small number in comparison to metropolitan regions?

These examples raise the issue of the relevance of an innovation system approach and question its explanatory value in the context of peripheral regions. They also bring into question the degree of generalization that can be drawn from the results obtained in this type of analysis. We shall use the case study of La Pocatière to analyse in what way the elements constituting an innovation system emerge and grow in a peripheral region. It should also enable us to better understand the innovation processes observed within firms and public organizations and to explain how this innovation system works.

3. Methodology

The case study of La Pocatière in Quebec focuses on the development of an innovation system in a peripheral region and subsequently addresses key factors affecting

innovation dynamics in this region. La Pocatière is considered to be a peripheral region in as much as it is located beyond the main metropolitan areas. It can also be considered a peripheral region because of its relatively low population density in relation to other regions in Quebec or even Canada.

The present study follows a multi-step methodology. First, a review and analysis of historical documents was carried out in order to identify the factual elements necessary to reconstruct the evolution and institutional history of education, applied research and technological transfer in the region under study. These historical documents include activity reports, periodicals and publications, biographies of major figures, chronologies and histories of public organizations, statistical series, etc. Second, data from Statistics Canada were used to draw a portrait of the economic structure of La Pocatière. Third, interviews were carried out with corporate managers and directors of firms, government agencies, knowledge-support organizations and educational institutes in La Pocatière (table 1).

The population of this study was identified through the Economic Development Corporation of La Pocatière's official directory, which includes a list of all firms and other types of organizations in the region. The chief executive officer for each organization was identified and sent a letter explaining the project. All participants were contacted by phone to schedule an appointment. Out of 28 private and public organizations, 23 responded and face-to-face interviews were held between November 2005 and March 2006. The response rate for the study was

Table 1. Interviews conducted in La Pocatière, 2005–2006.

<i>Private sector firms</i>
Bombardier
Technologie Axion
Graphie 222
Technologies Lanka
Dynaco agri-food co-operative
Agro Enviro-Lab
PremierTech biotechnology
GéoKam
Le Mouton Blanc Cheese-makers
La Pocatière Bakery
<i>Educational organizations</i>
La Pocatière College
Institute of Agri-Food Technology
Centre for Training in Metallurgy
<i>Technology transfer and supporting and complementary organizations</i>
Specialized Centre for Engineering Technology
Quebec Photonics Centre
Centre for Expertise in Agroforestry Production
Quebec Centre of Expertise in Pig Production
Quebec Centre of Expertise in Sheep Production
Quebec Bio-food Development Centre
Lower St.Laurent Ecological Collectivities
<i>Economic development agencies</i>
Kamouraska Local Development Center
Kamouraska Community Futures Development Corporation
La Pocatière Economic Development Corporation

as follows: 10 out of 12 firms, 3 out of the 3 educational institutes, 7 out of 9 technology transfer and support organizations, and 3 out of 4 economic development agencies. All the interviews were recorded and transcribed. The average length of the interviews was approximately one hour. The interview guide is designed to take into account several aspects relating to empirical investigations on innovation systems. The questions invite respondents to identify the characteristics and main activities of their organizations and their main sources of information in relation to innovation activities; to qualify their links with other organizations within the region, as well as outside the region; to identify the regional barriers that constrain the organization's potential for innovation; and to qualify the local factors and behavioural rules that support innovation and economic development.

4. The anatomy of the innovation system in La Pocatière – past and present

The area under study includes two localities: the town of La Pocatière and Sainte-Anne-de-la-Pocatière. These two localities constitute the so-called area of La Pocatière and are part of the St. Lawrence administrative region in the province of Quebec. This area is located in a rural region approximately 100 km north-east of the city of Quebec on the south shore of the St. Lawrence River's estuary (figure 1). Table 2 shows the main physical, demographic and economic characteristics of the region and compares them to corresponding regional and national characteristics. The La Pocatière region extends over 77 km², with a population of 6225 inhabitants.²

From a socio-economic perspective, when compared with the region of the Lower St. Lawrence and the province of Quebec as a whole, La Pocatière is, in several respects, performing well according to the main social and economic indicators (table 2). La Pocatière also shows a higher concentration of workers both in the primary and

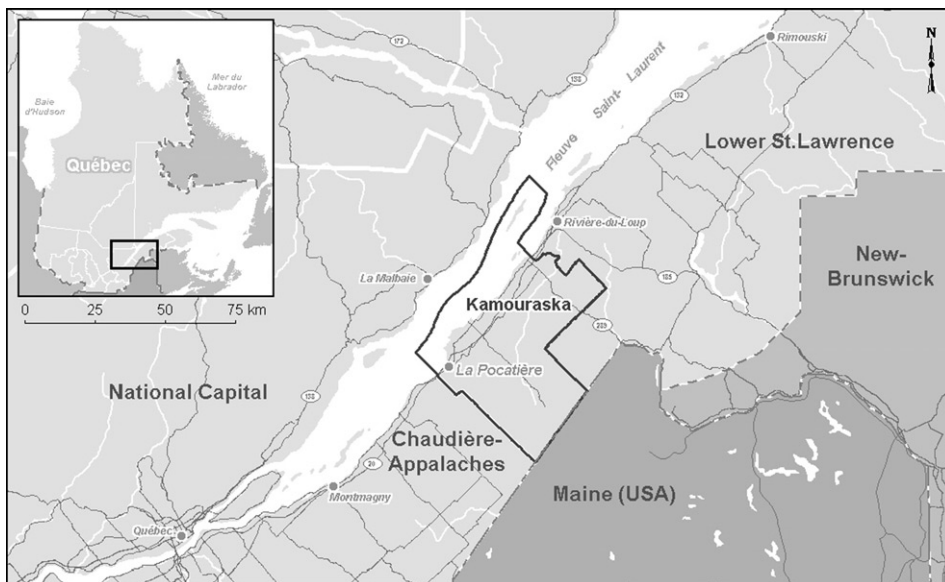


Figure 1. Location of La Pocatière.

Table 2. La Pocatière's socio-economic characteristics.

	<i>La Pocatière</i>	<i>Lower St.Lawrence</i>	<i>Province of Quebec</i>
Area (km ²)	77	22 400	1 667 400
Population, 2005	6225	201 900	7 598 100
Population growth, 1991–2001	–3.4%	–2.3%	5.0%
Activity rate, 2001	65.4%	58.9%	64.2%
Unemployment rate in 2001	7.8%	13.2%	8.2%
Employment in 2001	3255	92 880	3 644 378
Primary sector	6.3%	11.2%	3.9%
Secondary sector	26.0%	17.9%	22.2%
Tertiary sector	67.7%	70.9%	73.9%
Total employment by manufacturing industries, 2005	1620	11 019	513 083
High value-added sectors	8.0%	1.4%	10.1%
Medium-high value-added sectors	83.4%	23.0%	15.3%
Medium-low value-added sectors	2.9%	14.7%	27.4%
Low value-added sectors	5.6%	60.9%	47.2%
Skilled labour, 2005			
Natural and applied sciences and related occupations (%)	6.6%	4.5%	6.4%
Population with a university degree (%)	22.2%	13.4%	20.3%

Source: Statistics Canada, various years.

secondary sectors than does the province of Quebec, and, within these sectors, the most significant activities are in the agri-food and transport industries. The level of education and schooling of its residents is very high, in particular in natural and applied sciences and related occupations, including a large proportion of workers with university degrees.

In short, La Pocatière's economic development has not experienced the same patterns and trends that usually characterize the economy of other peripheral regions in Quebec (Polèse and Shearmur 2006). This can be explained by the historical processes particular to the development and evolution of this region and, in particular, by the importance of certain actors, public organizations included in the system and enabling innovation activities and technology transfer.

4.1 Institutional set-up and evolution: 1827–2005

The development of innovation systems is never instantaneous, but the result of an historical process conditioned by time and space. Consequently, the success of some regions is due, at least partly, to the specific historical conditions that influence their development trajectory and that had an impact on their economic well-being, as well as creating competitive advantages that enabled them to differentiate themselves from other regions.

In the case of La Pocatière, the institutional set-up and evolution of its innovation system can be divided roughly into four periods that set it on a unique path of development (Doloreux *et al.* 2007a,b). Table 3 depicts some examples of major innovation activities developed by local public organizations in La Pocatière since 1850.

Table 3. Some examples of innovation activities, 1850–2005.

<i>Date (s)</i>	<i>Innovation activities</i>
1865	Development of a control system for dairy production (25 years before the Babcock method)
1871	Planning and construction of coastal drainage system on land belonging to the College farm
1895–1900	Development of the Richard ploughing systems to improve drainage in heavy soils
1913	Introduction of the first mechanical milking machine in the region
1910–1985	Over one hundred scientific articles are published by the <i>Ferme expérimentale fédérale</i>
1920–1960	Animal breed improvements: Ayrshire cow; Percheron horse before mechanization of farming equipment; Plymouth Rock Barré hen; etc. Important activity: distribution of choice specimens and breeding stock
1936	Birth of the first calf by artificial insemination in Canada at the <i>Ferme expérimentale fédérale</i>
1936–1945	Development of pig breeds for the demand in lean pork and distribution of stock throughout Canada
1923–1945	Research in beekeeping (wintering, hybrid queens, spraying of orchards, etc)
1920–1955	Research on silage, fodder, cereals, beet (for fodder and sugar), fertility of pastureland, etc. Development, production and distribution of seed stock of registered quality (often via farmers open to innovations)
1930–1950	Research on the effects of lime, manures and phosphate fertilizers on yields in longer and later pasture rotation
1950–1970	Research on chemical weed killers, pesticides and potato diseases (production, certification and distribution of seed stock from as early as 1918)
1938–1950	Distance learning to improve vocational focus of fishermen in Gaspésie and Côte-Nord; training in co-operative work and organizations
1940–1960	Pedological mapping of Quebec counties by the laboratory for soil analysis of the Provincial Department of Agriculture
1985–2005	Technological development of the CSTPQ, one of the first college-level centers of technological transfer in Quebec
1985–2005	Subcontracting between Bombardier (arrived in the area in 1970; emphasis on train transport since 1976–1980) and local companies: Pocatec (electronic display systems, etc.), Graphie (industrial design, etc.), CSTPQ (soldering module with stainless steel laser)
1985–2005	Applied research in agro-environment: composting domestic waste in an agricultural environment; fertilizer distribution with GIS.

4.1.1 Period 1 – setting up pioneering institutions and innovations (1827–1911)

The first landmark in the area's history of innovation is the foundation of the College of Sainte-Anne-de-la-Pocatière in 1827, in a small rural community of a few thousand people. This college was created to teach basic literacy to the practically illiterate population, and to promote higher education. Its vocation in agronomy started in 1859 when the college authorities created the School of Agriculture of Sainte-Anne-de-la-Pocatière, the first agricultural school in Canada and the second in North America. This school specifically aimed to improve farming practices among French Canadians through practical training and by teaching a rational agriculture, based on the transfer of knowledge at the leading edge of agronomic progress and the adoption of innovations in farming methods and animal husbandry.

4.1.2 Period 2 – growth and influence of the agricultural science institutions (1911–1962)

In 1911, the federal government decided to set up a Federal Experimental Farm in Sainte-Anne-de-la-Pocatière, the first of its kind in the province of Quebec. It was a research institution, but also aimed to be a demonstration station, a model farm

with several specialized satellite federal offices and laboratories, also located in La Pocatière: a Federal Potato Certification Service (1918), a Plant Health Laboratory (1922), a Botanical Laboratory and Entomological Laboratory (1949), and a Plant Protection Service. As for the Agriculture School of Sainte-Anne-de-la-Pocatière, affiliated with the Université Laval de Québec in 1912, it continued to increase its number of students and became the Agriculture Graduate School. Henceforth, it provided teaching in agricultural sciences proper, leading to a bachelor degree. In 1940, the school became a Faculty of Agriculture, thus recognizing the value of the research carried out there and granting it the power to award masters and doctoral degrees. During this time, and also in La Pocatière, other important institutions were created to complement the existing institutional framework of this innovation system: the Fisheries College of Sainte-Anne-de-la-Pocatière (1938) was given the mission to train scientists able to manage the development of fisheries, to create a strong economic and social organization among fishermen and to professionalize and structure the co-operative movement of fishermen in Quebec. In 1942, the Provincial Agriculture Department's Laboratory for the Division of Land was set up in La Pocatière. During the 1940s and 1950s, up to 15 pedological agricultural scientists classified and mapped the province's soil and published county pedological reports.

4.1.3 Period 3 – rupture, economic diversification and the development of technological activities (1962–1997)

In the early 1960s, La Pocatière thus presented all the characteristics of a lively scientific centre serving the surrounding rural community. In 1961 and 1962, two events altered the institutional set-up of this innovation system: the Faculty of Agriculture closed (and moved to Sainte-Foy in the suburbs of Quebec City), leading to the disappearance of the Fisheries College of Sainte-Anne-de-la-Pocatière. Following on from this, there was a considerable decrease in research and in the dissemination of results from the Federal Experimental Farm, which itself finally closed in 1997. Although La Pocatière's vocation in agricultural science was in relative decline at this time, it was the chosen location, in 1962, for one of Quebec's two Institutes of Agri-Food Technology. This institute is a school for technical education at college level, and its focus is on applied research and on improving and popularizing technical expertise in agriculture. It was briefly supported by one of the provincial agricultural research stations that the ministry set up within the institute during the 1970s but which closed in the mid-1980s. However, this relative decline of La Pocatière's agronomic pole at the end of the 1960s took place in the context of a major change in the trajectory of its development: the founding of a new teaching institution, the La Pocatière College, and the arrival of a major manufacturing company, Bombardier, both of which contributed to diversifying the local economy and developing a new type of activity. It was the mobilization of the milieu, and not prior governmental plans that initiated the creation of a college at La Pocatière. This new organization rapidly developed a specialized programme in transport and engineering technologies, drawing students from all over the country. The success of the development of this expertise was later confirmed in 1982 with the creation of centres for technological transfer, the Quebec Specialized Centre for Engineering Technology and the National Center for Transport in particular.

4.1.4 Period 4 – redeployment and growing complexity of the elements in the innovation system (1997–2007)

Since the mid-1990s, a series of new initiatives increased the complexity of the institutional context for training, research and transfer in La Pocatière's innovation system, particularly in its historically-grounded vocation for agricultural science. As a result of local concertation, the Federal Experimental Farm was transferred to a local organization and later became the Quebec Bio-food Development Centre, created specifically to manage the Farm's assets and to stimulate development of the agriculture and food pole in La Pocatière. This provided the basis for creating and consolidating other research centres to which the Quebec Bio-food Development Centre rents land and buildings, and for technological transfer and the dissemination of innovations. This is the case, for example, for the Centre of Expertise in Sheep Production created in 1997 and the Quebec Centre of Expertise in Pig Production a few years later. In the early 2000s, the Institute of Agri-Food Technology began a technical programme in agri-food transformation, and it worked with the Quebec Bio-Food Development Center to create, in 2004, an Agri-Food Processing Incubator. Like college centres for technological transfer, the incubator makes available to existing and start-up firms its premises and laboratories both for internships and specialized services for the development of industrial products and processes. It does so, in part, by purchasing sophisticated equipment, and future plans include devoting part of its equipment and premises to industrial incubation specifically for start-up companies. Likewise, having agreed on the development of an agri-food vocation, but also of the agro-environmental and agroforestry fields, and in collaboration with the Quebec Bio-food Development Centre, La Pocatière institutional actors collectively agreed to initiate a technopolitan project: the Lower St. Lawrence Agrobiopole.³

4.2 Industrial development in La Pocatière

The origin of La Pocatière's industrial development dates back to the mid-1960s when Moto-Ski began making snowmobiles in the region. Rapidly, Moto-Ski which was bought by Bombardier went through phenomenal expansion and became the dominant employer in the region. From being a small institutional town with an educational and research role in agriculture, La Pocatière became a small mono-industrial town. The arrival of this private actor radically changed the economic structure of La Pocatière. The new environment became the breeding ground for innovation activities and unprecedented collaboration between the private manufacturing firm and some sections of the existing institutional framework, which had previously been embedded in agri-business activities.

Popular tradition in the region sometimes uses the expression 'historical accident' to describe the fortunate but unexpected arrival of this new economic activity which soon became indispensable to the local economy. In fact, the expression reminds us how little any government policy, planning or pre-existing teaching and research organizations had to do with businessman Charles-Eugène Bouchard's plans (and the region's agricultural and agricultural science role, both in relative decline during this period, had even less to do with it). Bouchard chose La Pocatière for the location of his plant because he was originally from this region and said himself that, in his undertaking, he had only ever been impelled by the idea of creating local employment for young adults in this part of the country, at a time when they were migrating to the

major cities of Quebec at very high rates (Billette and Robichaud 2002). The only coincidence that should be noted concerns the fact that this introduction of industry came in the middle of a bleak period (1962–69) when La Pocatière had just lost several longstanding agronomic and agricultural institutions, when the influence of its College was fading in the context of the growing secularization of society,⁴ and before it had gained its public college (CÉGEP). Since its creation, Moto-Ski and Bombardier have expanded rapidly: it went from some 15 employees in 1963 to 650 in 1971, and the company had approximately 1000 employees by 2005. This figure accounts for approximately 60% of total employment in La Pocatière.

Another unique characteristic of the area is the concentration of spin-off firms. Technologic Axion (1980), Graphie 222 (1980), Technologies Lanka (1992) and Nova Biomatique (1995) were founded during the 1980s and 1990s and specialized in engineering technologies. Two other features of the spin-off process which seems to have gained momentum in La Pocatière stand out. First, it is highly localized in nature: all these spin-off companies originated from organizations operating in the region. Second, spin-offs from public organizations clearly dominate. All these companies emerged from college and research centres, are now well-established and operate on international markets. Apart from Technologic Axion which has 130 employees, the other companies are small, employing less than 20 workers.⁵

In the early 1990s, some agri-food firms and agro-environmental companies chose to locate in La Pocatière because of the region's solid institutional base. This significantly broadened the industrial structure of this territory towards agriculture-related businesses, introducing some new elements in high-tech production. Some of these companies are world-leaders in their field, such as Premier Tech Biotechnology, founded in 1997 and which specializes in products and technologies to enhance plant growth and disease resistance. In addition, La Pocatière has seven companies which are not related directly to transport equipment, engineering technologies, or the agri-food industries. These firms are small and serve mainly local markets.

4.3 *The current structure of La Pocatière's innovation system*

Today, La Pocatière's innovation system comprises five main components which are presented in tables 4 and 5.

The first component consists of two poles that together make up the production system in La Pocatière. On the one hand, there is transport and engineering technologies: a big leading company, managed from its headquarters elsewhere (Bombardier), and four resolutely technological firms that are spin-offs from local public organizations, one of which has over 100 employees. The second pole is in agri-food and agro-environment: it includes seven small and medium size companies with varying degrees of intensity in their innovation activities (four are more involved than the others). In any case, the relatively small number of firms, combined with the fact that none share privileged links or industrial exchanges, makes it difficult to speak of a *cluster* in this innovation system.

The second component of La Pocatière's innovation system is composed of educational and training centres. Here, we have the two main teaching and training institutes, the Institute of Agri-Food Technology and the La Pocatière College. Both have an educational vocation to train technologists in different fields of activity in agri-food, as well as a broader professional vocation with a variety of study

Table 4. Industrial structure of the innovation system in the La Pocatière region.

<i>Company name</i>	<i>Year of foundation</i>	<i>Number of employees</i>	<i>Main focus</i>
<i>Transport equipment</i>			
Bombardier	1971	1000	Underground (Metro) and high speed trains
<i>Engineering technologies</i>			
Technologie Axion	1974	130	Transport communication systems
Graphie 222	1980	21	Industrial graphic design
Technologies Lanka	1992	7	Prototypes and electronic tools for railways
Nova Biomatique	1997	12	Control systems for agriculture
<i>Agri-business and related activities</i>			
Dynaco Coop. Agroalimentaire	1966	25	Agri-food cooperative
Agro Enviro-Lab	1995	12	Laboratory analysis
Laboratoires du Saint-Laurent	1998	6	Neutraceuticals and foods
Premier Tech biotechnology	1997	9	Products and technologies to enhance plant growth and disease resistance
Érablières des Alléghanys	1995	14	Sugar maple products
GéoKam	2004	(1 to 5)	Applied geomatics for agriculture
Mouton Blanc	2004	(1 to 5)	Ewe cheese
Other industries (7 firms)		About 75	Commercial printing, cleaning products, heating systems, bakery

programmes in applied and social sciences. Recently, these institutes have also sought to encourage applied research and technological transfer. At the Institute of Agri-Food Technology, the technological transfer mandate is managed by the institute's technological innovation service which contributes to finding outlets for applied research in which several of its professors have been engaged, primarily in the fields of agroforestry, the development of hedges as wind breakers, the management of manures and geomatics applied to agriculture. The College on the other hand, maintains close formal links (through internships for its students, sharing premises, laboratories and equipment, etc.), with the transfer centres it helped to set up in order to develop privileged links with companies in the milieu.⁶ Finally, the Centre for Training in Metallurgy was created to respond to the needs in expertise and staff training for metallurgical companies in the region.

The third component in La Pocatière's innovation system is composed of technology transfer organizations that provide expertise specifically geared to the needs of local companies. Among these we find the Specialized Centre for Engineering Technology, National Centre of Transport, Quebec Photonics Centre) in the engineering sector, and the Centre for Expertise in Agroforestry Production, Quebec Centre of Expertise in Pig Production, and Quebec Centre of Expertise in Sheep Production in the field of agri-food and agro-environment.

The fourth component consists of supporting and complementary organizations which support innovation and technological development activities. These are organizations or infrastructures that help new companies to settle in the area, especially local spin-offs, usually offering them support and technical assistance programmes. Among these, we find the Quebec Bio-food Development Centre,

Table 5. Institutional structure of the innovation system in the La Pocatière region.

<i>Organizations</i>	<i>Year of foundation</i>	<i>Number of employees (n)</i>	<i>Main focus</i>
<i>Educational and training</i>			
La Pocatière College	1969	250	Vocational and general education
Institute of Agri-Food Technology	1962	150	Technical education in agriculture, horticulture and agri-food transformation
Centre for Training in Metallurgy	2002	5	Training in metallurgy
<i>Technology transfer organizations</i>			
Specialized Centre for Engineering Technology	1984	40	Development and technological transfer in engineering technologies
National Centre of Transport	1990	–	Assistance for companies working on public transport
Quebec Photonics Centre	2002	2	Development and technological transfer in optical technologies
Centre for Expertise in Agroforestry Production	2000	5	Technical development for the improvement and marketing of agroforestry products
Quebec Centre of Expertise in Pig Production	1997	8	Development and technological transfer in ovine production and genetics
Quebec Centre of Expertise in Sheep Production	1998	2	Experimental platform for processes and methods in porcine production
<i>Supporting and complementary organizations</i>			
Quebec Bio-food Development Centre	1997	5	Services and support for bio-food technology companies
Biofood Incubator	2005	5	Business incubator in agri-food transformation, technical and scientific support
Agrobiopole	2005	2	Technopolitan events
Centre of the New Economy	1999	–	Designated infrastructures – advantageous tax measures
Industrial Park of Innovation	1992	–	Technological industrial park – local programme of subsidies and tax exemptions
<i>Economic development agencies</i>			
Kamouraska Local Development Center	1982	9	Local development, entrepreneurship, job creation, provincial programmes
Kamouraska Community Futures Development Corporation	1985	7	Local development, entrepreneurship, job creation, federal programmes
La Pocatière Economic Development Corporation	2000	3	Promotion and local socio-economic development of the La Pocatière milieu

Biofood Incubator, the New Economy Center, Innovation Industrial Park and the Lower St. Lawrence Agrobiopole.

Finally, the fifth component in La Pocatière's innovation system consists of local and regional economic development agencies. These are public institutions which are responsible for the implementation of policies and programs that aim to support local development. These public institutions include, among others, the Kamouraska Local Development Center, Kamouraska Community Futures Development Corporation (KCFDC) and the La Pocatière Economic Development Corporation.

In short, two significant characteristics are specific to today's innovation system in La Pocatière. First of all, it is truly a *micro system*, even if it includes, one might say, an all the more surprising concentration and density of public institutions, technological transfer organizations and spin-off companies. What is more, this system displays a strong institutional imprint and did not have a manufacturing component until the mid-1970s. For the most part, the public institutions that make up the innovation system are authentic local organizations and not branches or sub-divisions of provincial or national organizations.⁷

5. The dynamics of La Pocatière's innovation system

This section aims to identify the key factors and dynamics leading not only to innovation activity but also to the transformation and growth of the innovation system in La Pocatière.

5.1 *The relevance of institutional actors and their capacity to respond to economic and technological change over time*

The strong institutional character of La Pocatière's innovation system is not simply a recent phenomenon. It is one of its fundamental characteristics, embedded right from the start in the history of the area and confirmed and maintained throughout its evolution until today. This institutional character has provided La Pocatière's local innovation system with a development trajectory that is both original and unique because, unlike many other innovation systems that have developed in regions with some industrial tradition, La Pocatière has no obvious manufacturing past. Historically, this innovation system developed from a base of teaching institutions in an essentially agricultural region.

This local innovation system developed first of all in the areas of applied research and technological transfer in agriculture and agronomy. It grew within teaching and research institutions that had close links with the production system, itself not made up of firms but of a vast number of fragmented producers. This agricultural class had to assimilate and integrate innovations related to the fast evolution of agriculture from the mid-nineteenth century onwards. These innovations led it from a subsistence and domestic agriculture to a commercial and industrial agriculture integrated within the global agri-food production system. It is only more recently that the innovation system diversified to include the industrial production of land transport equipment with the presence of the Bombardier factory, the applied research activities in engineering of the College and the creation of several companies specializing in subcontracting in the field of transport.

A thorough analysis thus brings out the strong institutional character of this local innovation system. It shows that an institutional framework for activities relating to innovation (technological development, diffusion, etc.) can provide means and stability to a modest system and guarantee its relative durability, thanks to the persistence of these local public organizations.

Our analysis also highlights an even more important point: it demonstrates clearly that a RIS need not rely only or mainly on a co-ordination dynamic between companies but can be built on co-operation between local public institutions.

5.2 *Community entrepreneurs*

Milieux with high levels of institutionalization are often presented and considered as less favourable for the establishment and development of innovation systems. However, in the case of La Pocatière, public institutions play a fundamental role in defining new opportunities for the region and the system's capacity to generate new knowledge and local innovations. What strikes us as particularly important in this context is the mobilization of individuals around entrepreneurial initiatives emanating from public institutions, and the emergence of networked activities centred around a common desire for initiating new business activities based on the community's strength.

This situation points out the importance of community entrepreneurs in the La Pocatière innovation system. Community entrepreneurs are organized actors who envision new institutions as a means of advancing interests which they value highly for the development of their community (DiMaggio 1988, Johannisson and Nilsson 1989). The notion of community entrepreneurship also focuses on the manner in which interested actors or individuals influence the institutional context (Beckert 1999). Community entrepreneurs play a central role in identifying opportunities, framing issues and problems pertinent to the community, and acting to mobilize constituencies with the principal objective of connecting their activities and interests with those of other actors in the milieu (Herlau and Tetzschner 1994).

Given the strong presence of public organizations in La Pocatière, the analysis shows that key actors,⁸ including both individuals and organizations, have been able to develop original mechanisms or set up common structures through local socio-economic networks to initiate new economic and institutional activities. Some of these actors have also displayed an unusual ability to find outlets for innovations they have developed in the context of their own activities.

Three examples illustrate community entrepreneurship in La Pocatière particularly well. The first is the creation of the Specialized Centre for Engineering Technology in the early 1980s. This was a real college-level centre for technological transfer before such organizations were even recognized: it was a precursor of what the government would turn into the College Centre of Technology Transfer programme a few years later. Relying on the importance of the teaching programme in engineering which had acquired a significant reputation in Quebec, the purpose behind setting up the SCPT was to create an instrument to put forward and market the applied research initiated and carried out at college level through technological transfer. The result of this initiative, 20 years later, is that the Specialized Centre for Engineering Technology is a 'model of excellence' among the 30 other College Centres of Technology Transfer in Quebec and, a novel situation, draws 90% of its funding from

private contracts (250 clients, 950 projects). In addition, this centre itself demonstrated institutional entrepreneurship by creating a private company, Technologies Lanka. The aim of this firm is to sell licences for technologies developed by the centre itself, equipment and electronic components destined for companies in the rail industry. Technologies Lanka has thus been able to retain for the Specialized Centre for Engineering Technology the commercial benefits of product and process innovations developed by the college.

The second example of community entrepreneurship includes initiatives taken by several actors from different public organizations to create a non-profit organization, originating in the milieu itself, for the purpose of recuperating, managing and developing assets of the Federal Experimental Farm which the government started closing down in 1995. By 1997, a consortium including a variety of public organizations in the area (local authorities, La Pocatière College, Institute of Agri-Food Technology, etc.) had created the Quebec Bio-food Development Centre so as to retain the experience of this 80-year-old organization in La Pocatière. This centre offers a variety of services, ranging from marketing and technological transfer to the provision of laboratories and trial sites for bio-food development. What is more, this centre is financially viable because it rents space to companies and centres of expertise in the field of agri-food and agro-environment, space that has contributed to the creation of four new companies (Premier Tech biotechnology, Laboratoires Saint-Laurent, Érablières des Alléghanis, AgroEnviro-Lab) and two centres of expertise and technological transfer (Quebec Centre of Expertise in Pig Production and Quebec Centre of Expertise in Sheep Production). As in the case of the Specialized Centre for Engineering Technology, the Quebec Bio-food Development Centre's activities gathered the conditions necessary for the latest initiative in institutional entrepreneurship with the Institute of Agri-Food Technology, the creation and funding of governmental programmes for the construction of the Bio-food Incubator. This was made possible because the institute had previously obtained permission to provide a new technological programme in agri-food, which required space and laboratories for internships and student company start-up projects. The results of this partnership show how institutional entrepreneurship comes from the convergence of complementary interests: the Quebec Bio-food Development Centre develops its assets and attracts new activities while the institute provides itself with the means to dispense its new technical programme.

The last example of community entrepreneurship is more modest and emanates from the institutional will to set up innovating organizational initiatives through the recent creation of the Centre for Training in Metallurgy. This centre is the result of a collaboration between the College of La Pocatière and the School Board for Kamouraska-Rivière-du-Loup and aims to provide not only training programmes, whether for beginners, experienced workforce or customized, at secondary, college and university levels, but also specialized services, such as laboratories, R&D, expertise and consultation for companies in the metallurgy sector.

These examples show how individuals and organizations that are part of La Pocatière's innovation system have been able to identify new prospects and turn them into opportunities for development and institutional advancement, to extend their expertise, and create or maintain 'competitive niches'. It also highlights the ability of key individuals to improve their assets so as to maximize and bring together their specific achievements and competencies, relying on local

achievements and expertise, in order to become and remain competitive and connected within their environment.

5.3 *Knowledge exchange and innovative co-operation*

The analysis of innovation activities and co-operation cannot be interpreted without considering the characteristics and development of the production system in La Pocatière, which has evolved mainly toward transport and engineering technology.

Research strategy and innovation processes arise mainly from Bombardier and the spin-off firms specialized in engineering technology. Overall, improving competitiveness and creating innovation are common challenges for these companies, even though the ways in which they manifest themselves in practice are somewhat different. In La Pocatière, the trend in innovation process is predominantly focused on solutions and developing incremental innovations rather than being research intensive and oriented towards the development of first generation innovations. Most of these firms are not engaged in R&D and they typically focus on product development. Firms overwhelmingly report that customers and suppliers are the main sources of information and collaborations. There is a variety of customer relations activities, but they are established mainly with international customers, especially in the USA and in Europe. Local public organizations such as technical colleges, research institutes and technology transfer centres are sources of innovation, and many firms indicate that they have some type of relationship with these organizations.

Thus, these firms experience similar business strategies and carry out innovation processes that are similar to those observed within other firms in other sectors and regions. The production system in La Pocatière has reached a certain maturity, especially in the pole of transport and engineering technologies, but we now also observe an emerging pole in agri-business, still at an embryonic stage, with the development of new technologically-based companies created as a result of institutional efforts around initiatives coming from the Quebec Bio-food Development Centre at the former Federal Experimental Farm.

Central to all accounts of innovation system formation and development is the notion of knowledge exchange and innovative collaboration among firms, and between firms and other organizations. In our analysis, several types of collaboration emerge characterizing the nature of interactions between private and public organizations in La Pocatière. The first type relates to inter-institutional collaborations. These collaborations between local organizations are supported by frequent day-to-day contacts and are embedded in interpersonal relations. The main objective of these collaborations is to pull together resources and competencies. These collaborations are both strategic and political. Examples of such collaborations include the writing of applications and projects, sharing human resources, etc. Essentially, these collaborations are of an informal nature. The reasons evoked to justify collaborative strategies rest on a perception that assets and competencies need to be pooled, and the belief that complementarities can overcome the problems and barriers linked to the size and specialization of these organizations. For example, collaboration with the College and the Institute of Agri-Food Technology gives access to human and material resources; collaboration with the local economic development agencies gives access to administrative and technical resources; collaboration with the

Quebec Bio-food Development Centre and the Specialized Centre for Engineering Technology gives access to an infrastructure of research labs, etc.

The second type of co-operation relates to collaborations between firms. These collaborations are carried out mainly for the design of new products, the improvement of productivity in the organization and the marketing of new products. Most of these sorts of collaborations are developed with partners outside the region, mainly with international partners or integrated within the internal networks of large manufacturing groups (e.g. Bombardier). The nature of these collaborations is primarily commercial and firmly oriented toward technological innovation. For example, Graphie 222 developed international partnerships with companies in Europe to design a product requiring the characteristics of retro-lighting; Premier Tech biotechnology initiated a significant number of collaborations with research centres in Europe and South America for data and experiments, the exchange of information and to improve their knowledge in the process of certification; Axion and Technologies Lanka collaborate actively with North-American partners in the development of electronic parts and communication systems for railway transport. However, local collaboration between firms is practically non-existent or only occurs on an *ad hoc* basis. One of the reasons for this is that the production system lacks critical mass and there is, therefore, little complementarity between firms.

The third type of collaboration is between firms and local public organizations. These collaborations are frequent and intense in La Pocatière, often established to develop and commercialize technological activities. They are mainly established between spin-off firms and their parent organization. Indeed, these organizations offer an environment and conditions favourable for these firms to develop, apply, design and market their new products or services. For example, the SCPT, the National Center for Transport and the QPC are lodged in the College's buildings and thus use the College's research facilities. While these collaborations between firms and local organizations are intensive in the early phases of a company's development, they tend to be less important once external partnerships start to develop with other firms with which they will try to establish strategic alliances to acquire new markets.

5.4 *Barriers to innovation in La Pocatière*

Unlike densely urbanized regions, peripheral regions are seen as lacking in favourable elements and conditions for such a system to emerge and develop; the presence of several barriers to innovation is perceived as limiting or even hindering the development of these regions. It is interesting at this point of our analysis to describe some of the perceptions that prevail in La Pocatière concerning these barriers.

The perception that entrepreneurs and managers of public organizations have of La Pocatière's business environment, confirms what is, in fact, a characteristic of this milieu: La Pocatière does not have a business tradition or business culture which might otherwise have helped to create a manufacturing sector of small and medium-size companies.⁹ Consequently, the business climate is often qualified as unfavourable or even as a deterrent because of the presence of a single large firm (Bombardier) and a number of important local public organizations offering high salaries and high levels of stability. Surprisingly enough, the technological companies spawned within this context did not emerge from the big company, Bombardier, but from the public organizations (Pocatec, Balios (which later became Axion), Graphie, Nova Bio) and

technological transfer organizations (Lanka, Agro Enviro-Lab). These spin-off companies have had more or less formal collaborations with Bombardier, by providing a technological back-up service for its production lines, for example. Some have also sought to achieve the privilege of being a subcontractor to Bombardier and those that did succeed took off quite dramatically after they had obtained their first contract.

The spin-off firms rapidly initiated partnerships and business developments outside the region and gradually distanced themselves from their initial subcontracting relationship with Bombardier. Nowadays, the companies in the production system do not collaborate much, if at all, with each other at a local level. The size of the system explains in part why La Pocatière has only ever had a small number of companies and never generated a *cluster* locally, even one of a modest size.

However, even if the business climate is perceived as unfavourable for the development of companies, the institutional environment has, however, enabled the emergence of a small group of technological firms, thus confirming the dominating role of public organizations and their propensity for generating business activities.

An important parameter of a local environment is the size of its milieu. In La Pocatière, the milieu's small size is perceived, overall, as positive. It makes it possible to develop high level trust relationships since most individuals know each other personally and will often also meet on social occasions. Also, the success of mobilization movements and local initiatives relies in part on tightly-knit collaborations which can only be understood by taking into account a cultural dimension specific to this milieu. The small size of the innovation system and limited number of actors encourages the rapid development of efficient consultation. The privileged inter-institutional relationships owe much to close interpersonal relationships between individuals in key positions, people who are likely to influence decisions within their respective organizations in the pursuit of innovative territorial projects, thus also playing a direct or indirect role in the mobilization and co-ordination of all projects within the milieu.

Despite overall positive perceptions, several interviewees underline that a strong social proximity can also have less desirable effects. For example, it is more difficult to regain the confidence of partners after a mistake or the failure of a project, precisely because there are relatively few actors in the milieu. What is more, social proximity has ambivalent effects in the management of relationships because the latter are always personalized. Perceptions relating to size in relation to distance from the main urban areas, the metropolitan region around Quebec City in this case, are divided between the positive and negative effects of this location. As far as clients and markets are concerned, none of the technological companies identified distance from major markets as an important barrier to either productivity or the distribution of their products. However, interviewees were more ambivalent about the role of distance from major urban areas on the recruitment and retention of skilled labour.

Interviewees in companies and public organizations reveal that it is very difficult to attract highly qualified professionals (engineers and technicians) to La Pocatière and that this is an important barrier to innovation which their organizations have to overcome. However, this is not so much related to the peripheral location of La Pocatière as it is the consequence of the current labour market situation for specific jobs. In certain market segments such as agroforestry or engineering technologies, it seems to be particularly difficult to recruit highly specialized staff.

The peripheral location of La Pocatière simply adds extra complexity to the recruitment of suitable candidates in these fields.

This barrier becomes even more difficult to overcome when one has to take into account the professional integration in La Pocatière of a partner, also highly skilled in his or her profession. This appears to be as important, if not more so, as the candidate's own job in his or her final decision to move to La Pocatière. However, bearing in mind that the Quebec metropolitan region is about one hour away, the question of distance from major urban centres can also be reversed: Quebec is actually sufficiently close to enable reconciling place of residence within the Quebec area and commuting to work around La Pocatière. Of course, La Pocatière is not as peripheral as many other regions in Canada. It is at the very limit of the area in which one can expect Quebec City's agglomeration economies to have a major impact (generally, there seems to be a distance of about 100 km over which the influence of a large city can be felt; see Polèse and Shearmur, 2006). Therefore, although La Pocatière is 'located beyond the main metropolitan areas', commuting to Quebec is feasible, and particularly for anyone choosing to live to the west of La Pocatière and commuting to the south eastern suburb of Quebec, around Lévis (or the reverse).¹⁰

The recruitment problems associated with La Pocatière's location seem to be less of an issue for the graduates of the many local institutions, especially those coming from the Institute of Agri-Food Technology. This institute, among others, supplies highly qualified workers who are continually contributing to developing the region's labour market. However, while the educational institutes in La Pocatière are able to produce a certain amount of local, technical, and human capital, they are obviously unable to generate all the specialists that are needed in the region.

Unlike large metropolitan areas that, except at the margin, can generate a substantial proportion of their own specialized labour and can quite easily attract the specialists it lacks, peripheral regions always need to be turned towards the outside for many (if not most) recruitment purposes (Rohr-Zänker 2001). This is a characteristic of many such regions and La Pocatière may have an advantage here over even other more peripheral areas: its relative proximity to Quebec is important in terms of access to cultural, leisure and major health facilities, but also – in a few cases – for daily commutes, albeit rather long ones (about 100 km).

At the same time, several interviewees did also suggest that the distance from Quebec has a positive effect, making it possible to retain and stabilize skilled labour since, once recruited and settled in the region, people are less likely to leave. Arguments put forward include quality of life, a lower cost of living than in an urban centre and easy access to the outdoors and the landscapes for which the region is famous.

6. Conclusion

The case study of La Pocatière illustrates a number of empirical and conceptual issues relating to the structure and functioning of innovation systems in peripheral regions. Empirically, we see that size and location have not hindered the emergence and development of an innovation system in La Pocatière, albeit a small one but a 'system' nevertheless.

La Pocatière is a system that has developed in an environment with a rich tradition and long history in innovation (through teaching, popularization, diffusion,

applied research, technological development, etc.). To this extent, it presented from as early as the mid-nineteenth century the characteristics of an innovation system before academics coined the term. The system's own heritage is a comparative advantage and has been exploited to set up convergent strategies and establish territorial development projects which, if not always explicit, were nevertheless conscious, deliberate and mobilizing.

This system is also of a strong institutional nature; indeed, it is primarily institutional, given that there was not much manufacturing tradition and very few manufacturers, if any, until the mid-1970s. At a stretch, one could take activities relating to innovation and the diffusion of innovations during the heyday of its influence in the fields of agriculture and agronomy, and draw up the picture of a production system based on innovating agricultural firms, model farms, in other words, a local pool of independent and fragmented agricultural producers perceived like so many small and medium-size businesses. In any case, the small number of firms and the paucity of inter-industrial exchanges make it difficult to speak of industrial clusters in this system. At the risk of repeating ourselves, La Pocatière is first and foremost an innovation system tightly managed by a dominating public structure.

In this case study, the high level of concentrated and specialized knowledge infrastructure, efficient technology transfer and strong human capital appear to be key factors leading to innovation activity as well as the development and growth of the La Pocatière's innovation system. The question of human capital is not so much a condition as a factor due to the strong imprint of educational and other public organizations on the system. Sticky knowledge is thus developed mainly by public organizations and their activities in applied research and the diffusion of technological activities. It is precisely because there are so many public organizations in the milieu and because of its educational vocation that it possesses a human capital advantage.

The findings exceed the limits of our study and feed into the general discussion on regional innovation systems. The results of this research reinforce the message which highlights the competitive posture of innovation systems in peripheral areas. This example provides empirical evidence of alternative strategies for peripheral regions to develop capabilities for innovation through the development of an institution-driven RIS in the periphery. Studies on RIS have hardly ever directly addressed the issue of the development and growth of an institutional-based innovation system. Indeed, most studies in RIS research have been carried out referring to ideal-types or typologies (Cooke 2001) or by focusing on specific innovation barriers (Tödtling and Trippel 2005). In the attempt to fill this gap in the literature, this paper has reported extensive evidence on the key factors and dynamics leading to innovation and to transformation and growth in a peripheral context. Most importantly, the empirical evidence has shown how La Pocatière has managed to deal with one of the main barriers in peripheral regions, organizational thinness (Tödtling and Trippel 2005), through the development of an institution-driven RIS.

The results also provide some evidence of the importance of recognizing the different ways in which innovation systems function. The variety of forms they may take makes it possible to counteract the typical stylized description of an innovation system, all too often illustrated by the metropolitan model or that of regions with high population densities. Metropolitan examples are the ones most often quoted in the literature but are no doubt an abstraction based on a reality that is far more varied and just as complex as that of innovating processes in peripheral regions. Every region, whether peripheral or central, has its own specific characteristics in terms of

competencies, traditions, institutions and systems of relations between institutional and social actors.

The results presented here also show the importance of recognizing local institutions as actors and factors generating appropriate forms and practices to enhance innovation potential. They should, therefore, have a central place in the analysis of the functioning of peripheral innovation systems. The results highlight the variety of institutional and organizational structures available locally to help to support and develop innovation. They also underscore the variety of institutional proximities that can develop within an innovating environment. Given this institutional context, research should take into account the many different types of network configurations, as well as the co-ordinating mechanisms and processes favourable for the development of innovations and of RIS.

From a policy perspective, one important lesson can be extrapolated from the case of La Pocatière. In order to improve the efficiency of innovation capabilities in peripheral regions, governments should not only direct their efforts towards enhancing building capabilities of the public regional knowledge base. The innovation potential of an 'institution-driven' RIS could be more efficiently exploited if the individual competencies in public organizations and systems of relations between such organizations and social actors were promoted and supported. In other words, governments should acknowledge the role of public organizations as drivers of innovation processes and change in the economies of peripheral regions.

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Notes

1. These externalities, as defined by Malmberg (1997), include the presence of skilled labour, production inputs (subcontractors, services and support for innovation, etc.) and regional technological spin-offs.
2. To this population should be added between one to three thousand students a year who come to study here because of La Pocatière's role as a regional education centre.
3. The Lower St. Lawrence Agrobiopole is a network organization bringing together the various public and private actors in the area in order to promote and support industrial and commercial technological innovations in the sectors listed above.
4. Quebec society, its education and political life in particular, was dominated by the Catholic Church until the mid-1960s when a major shift, referred to as the 'Révolution tranquille', dramatically altered the power structure and social life of the province.
5. The spin-offs in La Pocatière employ collectively 170 people.
6. As such, the CÉGEP initiated the creation of the Quebec Specialized Centre for Engineering Technology (1982) and the Quebec Photonics Centre (2002), both located on its premises, as well as the Center for Training in Metallurgy (2002) in partnership with the regional school board.
7. The use of terms such as 'québécois' or 'national' in company names, both implying a strong Quebec national identity, can be attributed to their desire to be considered as reference points with a provincial or national influence within their own field of activities.

8. Community entrepreneurs in La Pocatière refers mainly to a group of persons or organizations which have initiated new business and institutional activities.
9. For example, if we exclude the unusual case of Bombardier and spin-off companies launched by institutions but supported by initial contracts with Bombardier, what is left of the manufacturing sector in La Pocatière is very little indeed. Although the production system is a component of innovation systems, here it is not as strong a characteristic as the history and presence of institutions within this local system.
10. Although this data would have been extremely useful, we were unable to identify the proportion of long distance commuters in the population of professionals working in the companies or the institutions around La Pocatière. Similarly, we do not have data on the commuting done to the Quebec City area by residents of La Pocatière.

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