Innovation and the development of the Canadian wine industry

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ABSTRACT

This thesis explores the innovation and development of the Canadian wine industry. The main objectives are to present the key development factors, innovation, and collaborations, with particular emphasis on collaborations with higher education institutes. It also empirically assesses the extent to which there aredifferences among the wine producing regions of British Columbia, Ontario and Quebec. The empirical analysis is based on a firm-level survey of 146 firms. The results show that the Canadian wine production is highly innovative and knowledge intensive. Despite that the wine industry in Canada has developed differently according to its regional context, the pattern of innovation is rather similar among firms.

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1 INTRODUCTION

1.1 Objectives and contribution

Over the past two decades, transformations have occurred within the wine industry that shaped the production of wine into a knowledge-intensive activity (Guiliani et al., 2011). Amongst those changes, the consumption and emergence of new wine producing countries producers was the main disturbance. The consumption of wine has increased in non-traditional areas and the demand has moved from quantity to quality. The increase in wine quality is the result of efforts from the industry to meet the quality standards set by educated consumers (Cusmano et al., 2010). Moreover, the success of New World wine countries such as the United States and Australia has disturbed the dominance of Old World wine countries such as France, Italy and Spain within the global market. As for Canada, it has recently emerged as a latecomer within the wine industry.

The objective of this thesis[1]is to investigate the innovation and development of the Canadian wine industry by examining its key development factors, innovation dynamics, and collaborations. Since collaboration with higher education institutes (HEIs) are regarded as valuable to the development and innovation dynamics of firms and regions (D'Este and Iammarino, 2010; Kaufmann and Tödtling, 2001; Lee, 2000; Lendel, 2010; Lester, 2005; Tödtling et al., 2009), particular emphasis will be given to these actors as innovation partners. Innovation is considered an interactive learning process that has a social nature and thus, is shaped by its environment (Edquist, 2005; Lundvall, 1992). Accordingly, this thesis

[1]This thesis analyses the data that was produced in the context of a five years research project entitled "Sectoral and Regional Perspectives on Innovation in Ontario: Theoretical Perspectives, Empirical Studies and Policy Implications" (2007-2012) conducted by Professor David Doloreux at the Telfer School of Management, University of Ottawa. Funding of this project was received by the Ministry of Research and Innovation in Ontario. The author of this thesis has been introduced to the research project as a research assistant in fall 2009.

will also empirically assess the systemic differences among the Canadian wine producing regions, British Columbia, Ontario and Quebec.

The interests of empirically investigating the Canadian wine industry are threefold: the first is sparked by the importance attributed to innovation by the industry (Cusmano et al., 2010; Giuliani and Bell, 2005; Tiffin and Kunc, 2011). Given the strong competitive pressures, product and process innovations are increasingly perceived as mandatory in the industry in order to foster the quality, value and marketing of wine (Aylward, 2005; Cusmano et al., 2010). This dependence on innovation is linked to the capabilities held in related technologies and industries such as chemistry, biology, mechanised equipment combined with ICT-based advances in instrumentation. Transformations within the industry in recent years have also contributed to broadening the knowledge in areas related to market and managerial fields (Cusmano et al., 2010; Dell'era and Bellini, 2009; Guiliani, 2011).

The second interest is the role played by the region in the development of the wine industry. For instance, spatial clustering is frequent in the wine industry, and two reasons may justify it. Firstly, wine firms are likely to cluster in certain regions favourable to grape growing. This may be associated with the concept of *terroir,* which expresses a complex system within a geographical area characterised by a strong identity. A *terroir* is shaped by both its human conditions (know-how, heritage, culture, etc.) as well as its physical conditions (climate, soils, rootstock, water availability, grape varieties, etc.) (Ditter, 2005; Gade, 2004; Mueller and Summer, 2006). These conditions allow the creation of a unique wine-growing environment and would suggest that each wine-producing region evolves differently. Secondly, location also plays an important role. Firms often choose tolocate in certain areas for institutional arrangements. For instance, some firms locate in certain areas to take advantage of quality control (e.g. appellation and certification of origin), knowledge infrastructure (research centres, higher education institutes specialized in winemaking) and critical mass (proximity to other wineries, winemakers).

The third interest is the fact that although a relatively limited number of empirical studies have examined innovation within the wine industry, none of them have analysed innovation of this industry in Canada. The Canadian wine industry has a short-standing tradition in winemaking. Indeed, compared to the Old World wine countries, this industry emerged recently and only started to develop for commercial purposes in the late 1980s. The Canadian wine growing conditions include a climate characterised by cold winters and a short harvest season. In addition, the Canadian wine producing-regions are not only geographically dispersed, but they also have different climate conditions, institutional frameworks and a different culture.

In order to investigate the features of development and innovation in the Canadian wine industry, this thesis targets the following research objectives:

1. Profile and describe the key development factors of the wine industry.
2. Analyse innovation dynamics, collaboration and their geographical distribution, with an emphasis on linkages with higher education institutes[2](HEIs).
3. Through the analysis of the first two objectives, the systemic regional differences of development features, innovations and collaboration will be examined.

This thesis uses empirical material taken from two distinctive sources. First, it includes a mixed variety of secondary sources that were used to describe the main developmental trends as well as tocapture the institutional and structural characteristics of the wine industry in Canada. Second, it uses original data collected through a firm-level survey[3].

The rationale for choosing the three Canadian wine regions of British Columbia, Ontario and Quebec is driven by institutional and geographical reasons. These regions represent three

[2] This research project uses the typology higher education institutes (HEIs) to include universities and colleges in the same category.
[3]The firm-level survey is presented in Appendix A.

provinces, formed by different wine sub-regions[4]. Institutionally, these three provinces have regulations and standards restricted to the provinces. British Columbia and Ontario appear as more similar in terms of general characteristics: both have mature as well as young wine firms expanding rapidly since the end of the 1980's. In addition, these two provinces have a relatively well-developed support infrastructure. In comparison, the wine industry in Quebec is in a primary stage of development. The industry in this province is composed of small sized and family-run wineries, and has a weak support infrastructure. Analysing the development and innovation dynamics of the Canadian wine industry is a novelty in innovation research. This will allow a better understanding of the characteristics of the Canadian wine regions. This is important because of the lack of homogeneity throughout the country.

1.2 Research questions and research gaps

This thesis aims to fulfil three research questions. The purpose of the first research question is to examine the recent developments in the Canadian wine industry. This is relevant given the lack of prior studies that consider the key factors involved in the development of the wine industry in Canada (Doloreux and Lord-Tarte, 2012a).

Literature on the key developmental factors of the manufacturing and the service sectors has flourished (Belussi et al, 2010; Forsman, 2011). Findings suggest different developmental trends contingent on the specific sector's conditions (Malbera, 2005). This thesis attempts to contribute to this literature by investigating the characteristics and development trends of the Canadian wine industry over the last 30 years. On the basis of these considerations, the first research question aims to describe the key characteristics of the Canadian wine industry, as well as the major factors of development in various regions:

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[4] For instance, Ontario has four official viticulture areas define by the VQA: Niagara Peninsula, Lake Erie North Shore, Peele Island, and Prince Edward County. British Columbia has five official viticulture areas according to the BC VQA: Okanagan Valley, Similkameen Valley, Vancouver Island, Gulf Island, and Fraser Valley. In Quebec, the wine production mostly takes place in the Eastern Townships, Montérégie, and Quebec regions.

Research question 1:*What are the salient features and characteristics of the Canadian wine industry's development?*

Considering the lack of prior studies on innovation investigating the Canadian wine industry, the aim of the second research question is to explore empirically innovation in the industry. There is a widespread agreement among scholars that innovation is crucial to economic development and competitiveness for firms and regions (Corpataux and Crevoisier, 2007; Fitjar and Rodriguez-Pose, 2011; Guillaume and Doloreux, 2011). This has also been demonstrated empirically within the wine industry (Aylward, 2004; 2006; Cusmano et al., 2010;Guiliani, 2011; Taplin, 2010).

This thesis attempts to describe the different dimensions of innovation at the firm level. These include the various types of knowledge sources, the different innovation activities, types of innovation developed and obstacles hampering innovation. With regards to these considerations the second question intends to investigate different aspects of innovation at the firm level:

Research question 2:*What characterises innovation in the Canadian wine industry?*

The third research question aims to investigate the nature of collaboration and its spatial manifestation. We are interested in the types of partners that are involved in collaboration for product development, with a particular emphasis on HEIs. There are only a few empirical studies on the wine industry that provide insight into the nature of collaboration and its impact on innovation (Alonso, 2010; Cusmano et al., 2010; Giuliani, 2011;). Innovation within the wine industry has been identified as a territorialised process, stimulated not only by local resources but also by the social and institutional context (Giuliani, 2007). However, firms cultivate multiple channels for innovation (market-based, institutional, or both) and exploit both endogenous and exogenous resources that will allow them to innovate. Innovative firms engage not only in local collaborations but also in extra-regional ones (Doloreux, 2004; Hassink, 2005; Simmie, 2005; Torre, 2009).

The literature places a high importance on collaborations and in particular to linkages with HEIs (Puuka, 2008; Ramos-Vielba et al., 2010; Tödtling et al., 2009). Given the early developmental stage of the Canadian wine industry, collaborations in general and more specifically with HEIs are of a particular interest. As observed in the literature, collaborations and HEIs linkages influence the local labour supply by offering the social foundations that underpin the production system and enhance the competitiveness and performance of the wine industry (Fensterseifer, 2007; Tiffin and Kunc, 2011; Veluzzi, 2010).

Given that the Canadian wine industry has a short history, we might presume that the level of the industry's knowledge base is rather limited. Therefore, collaborations in general and specifically with HEIs are relevant to build the industry's knowledge base and at the same time, contribute to its development. On the basis of these considerations, the third research question addresses the nature of collaboration, its spatial manifestation and impact on innovativeness:

Research question 3:*What is the nature of collaboration within the Canadian wine industry, its geographical distribution and more specifically the importance of higher education institutes on innovativeness of wine firms?*

1.3 Structure of the thesis

The thesis is divided into seven chapters. Following this introduction, the second chapter reviews the literature on innovationand presents the conceptual framework of this thesis. The conceptual framework in composed of two sections: the first section focuses on the concept of innovation, by presenting its typology and models. The second section analyses the different factors that can influence innovation by first presenting the relationship between firm's characteristics and innovation. Then, it explores the relationship between innovation and collaboration, with a particular focus on HEIs as collaboration partners. Finally, a focus is given to the regional context by introducing the mechanisms driving and supporting innovation and then presenting the factors influencing innovation disparities among regions.

The third chapter presents key empirical findings on the wine industry by introducing the factors responsible for innovation disparities among regions and the determinants of collaboration in wine-producing regions.

The fourth chapter describes the research methodology, by presenting the sampling, data collection, variables and analytical approach, and statistical considerations.

The fifth presents the expected outcomes with respect to the relationship between innovation and the characteristics of the firms, the nature of collaboration and the wine-producing regions.

The sixth chapter outlines the main characteristics and development trends of the Canadian wine industry. This is achieved by introducing the salient features of the Canadian wine industry, describing the key organisational actors, and finally comparing the developmental disparities among British Columbia, Ontario, and Québec.

The seventh chapter presents the empirical findings with regards to the innovation dynamics, collaboration and collaboration with HEIs of the Canadian wine industry.

Finally, a conclusion is provided in the last chapter. The key empirical findings, implications for theory as well asfor practices are discussed. Lastly, further areas of research are discussed.

2 LITERATURE REVIEW

2.1 Introduction

Innovation is regarded as an important driver for successful competition in the modern economy, as the engine of economic development, and as essential for social prosperity (Baldwin and Hanel, 2003; Edquist, 2005;Freeman, 1995; Malerba, 2007). According to the OECD (2008) innovation is a "key factor for the economic success of the OECD countries and a prerequisite for sustainable development"[5]. This chapter describes the different aspects of innovation and the different factors that may influence innovation.

2.2 Innovation

2.2.1 What is innovation?

The term innovation has different meanings. Most definitions concur on a degree of novelty and often view innovation as a strategy to attain a competitive advantage to meet the market requirements. For instance, the Oslo Manual (OECD, 1997) considers innovation as a way to manage the knowledge economy. Schumpeter, (1942) argues that innovation is the core economic driver of the capitalist system, since economic activities are based on creation, destruction, and restructuration of ideas.

Innovation can be described as a process as well as an outcome. Innovation as a process embeds a broad range of activities to improve the profitability and market position of a firm (Dosi*et al*., 1988; Isaksen, 2009; Lundvall, 1992). These require investments of resources to reach long-term goals. For instance, innovation activities include: R&D (internal and external), training, acquisition of external knowledge, acquisition of new equipment, marketing activities, etc. With regards to innovation as an outcome, the Oslo Manual,

[5] OECD, Open Innovation in Global Network, Policy Brief, November 2008

(OECD, 2007) considers innovation as the implementation of new or significantly improved product (good or service), process, marketing method or organisation method.

2.2.2 Typology of innovation

Innovations may take many forms. Traditionally, innovations in firms are seen in product and process. Since these two types generally involve the development or application of new technologies, these are called technological innovations (Schmidt and Rammer, 2007). However, only considering the technological perspective of innovation is incomplete, because it is not acknowledging the service sectors as well as other elements improving the current practices by non-technological innovations such as marketing and organisational practices. The Oslo Manual (OECD, 2007) definition of innovation includes both technological innovations (product and process) as well as non-technological innovations (marketing and organisational).

Moreover, innovation can be classified according to its level of novelty. On one hand, radical innovations refer to the disruptive ones (like the Internet and lasers), which are generally built upon new knowledge (Baldwin and Hanel, 2003). Theseinnovations are new to the world andmay profoundly modify the conditions of use and may involve technological breakthroughs. Radical innovations are relatively rare and may involve extensive changes in the production process. On the other hand, incremental innovations refer to modest continuous improvements built upon existing knowledge and resources, which may have a significant impact when cumulated over time. Generally, these are innovations new to the firms and implemented to keep up with competition. Thus, these do not profoundly change the industry dynamics or the users' behaviour (Baldwin and Hanel, 2003). Incremental innovations are relatively common and are less likely to require major changes in the production process.

2.2.3 Models of innovation

Innovation has been conceptualised differently through the last 60 years. It has evolved from a linear process into an open one. This section describes three models of innovation: the linear model, the interactive model and the open model.

2.2.3.1 Linear innovation model

The linear model of innovation is based on the view that innovation is a sequential process conducted within firms starting with basic research, then research development, and finally production and diffusion (Godin, 2006). This model suggests that innovations are the result of R&D initiated to respond to the market demand (demand-pull innovation) or following a scientific discovery (science-push innovation). This model was widely accepted until the 50s.

However, since the 1950s, major changes have happen within the economy and contributed to the limits of the linear model. For instance, the pressures on firms for innovation considerably increased and disturbed R&D activities (Trott and Hartmann, 2009). Rotherwell and Zegveld (1985) identify three main factors responsible for these changes: the first is the technology explosion, the second is the shortening of the technology cycle, and the third is the globalisation of technology. Thus, these requirements set by the competitive environment forced firms to look beyond basic research and R&D to accelerate their innovation's pace.

One of the main limits of the linear model is it's over simplistic view of innovation. More precisely, Kline and Rosenberg (1986) argue that the model omits the importance of the social dimensions of innovation and overestimates basic research. Also, the model neglects a multiple information sources and only takes knowledge inputs at one point in time during the innovation process. In addition, the linear model might focus too much on radical innovation and underestimates the value of incremental innovation.

2.2.3.2 Interaction innovation model

In response to the critiques addressed in the linear model, the interaction innovation model[6] was developed in the 1980's (Kline and Rosenberg 1986). This model extends the knowledge inputs to all the innovation process by considering various feedback and loops from market and science sources (Kline and Rosenberg 1986). The interaction among actors stresses the social dimension of innovation. In addition, the market (as opposed to basic research) is considered as the engine of innovation (Kline and Rosenberg 1986).

This model takes a systemic approach of innovation by considering what is relevant and what influence the innovation system. The innovation system embeds the complex relationship between a firm's internal dynamics and its external environment (Isaksen, 2009; Kline and Rosenberg 1986). Regarding the internal sources of knowledge, innovation emerges not only from R&D activities but also from other units inside the firm. With respect to the firm's external environment, it acknowledges the interactions with other partners, the specificities of the industry, as well as the institutional and cultural context (De la Mothe and Paquet, 1998; Lundvall, 1992).

2.2.3.3 Open innovation model

Chesbrough firstly introduced the model "Open Innovation" in the early 2000s. This author defines the idea of open innovation as "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology" (Chesbrough, 2003: XXIV). This model has stimulated a strong effervescence in the field of innovation research and R&D management. Open innovation is perceived as a strategic tool to broader firms' ideas and technologies, which leads to growth in opportunities and decreases in risk (OECD, 2008).

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[6] The interaction modelmayalsobe called the chain-linked model, as introduced by Kline and Rosenberg (1986)

This model creates a dichotomy with the linear innovation model (named as closed in this perspective) by arguing that firms cannot innovate in isolation in a globalised economy and stresses as compulsory the flow of ideas in and out of the firm in order to innovate. The switch from closed to open innovation occurred in response to multiple factors mainly due to globalisation, which enhanced the rise of private venture capital, reduced the time lag to product commercialisation and increased worldwide competition (Chesbrough, 2003; 2006). Despite its similarities with the interactive model with respect to the social dimension of innovation, the open innovation model differs by its emphasis on "external interaction and in the acceptance of the uncontrolled nature of the innovation process" (Tödtling et al., 2011:1886).

Aiming to push the open innovation model further and to build a more coherent literature on the definition of "openness", Dahlander and Gann (2010) proposed a classification of different types of openness into four categories based on two dimensions. The first dimension is inbound versus outbound and the second dimension is pecuniary versus non-pecuniary. The first dimension refers to knowledge created either inside a firm that is revealed to the external environment (outbound), or created by external sources of innovation for internal processes (inbound). Regarding the second dimension, pecuniary refers to knowledge acquired or sourced either through selling or licensing, while non-pecuniary refers to diffusion of knowledge without immediate financial rewards.

One should note that the most appropriate model of innovation mightvary according to the context of the industry as well as on a firm's individual innovation strategy. Indeed, a firm may strategically decide to develop fully internally a certain innovation in order to keep greater control and secrecy.For instance, firms from the pharmaceutical industry and from the national defense frequently adopt the linear model of innovation (Godin, 2006).

In the sum, innovation has sparked the interest of academics since the 21th century and is perceived as the engine of growth of the modern economy. Innovation takes many forms, which may be classified,on their level of technology involve (technological vs. non-

technological) or on their level of disturbance (incremental vs. radical). Innovation was initially conceptualised as linear, evolved as interactive, and recently was developed into the open model. The following section presents factors that may influence innovation.

2.3 Factors that influence innovation

The literature distinguishes, among others, three factors that influence firms' innovation (Doloreux, 2002; Lhuillery and Pfister, 2009; Lundvall, 1992; Malmberg and Power, 2005; Withers et al., 2011). These are the firm's (1) in-house characteristics (2) collaboration, and (3) the region where they are located. This section describes each of these factors and their impact on firms' innovativeness.

2.4 In house-capabilities

Literature has shown that firm's internal characteristics play a fundamental role in shaping innovation. This section reviews the literature on the influence of absorptive capacity, size, and age on innovation.

2.4.1 Absorptive capacity and innovation

The literature stressed the relationship between firms' level of absorptive capacity and innovativeness. According to Cohen and Levinthal (1990), absorptive capacity is the firm's "ability to recognise the value of new, external information, to assimilate it, and then to apply it to commercial ends". Absorptive capacity is perceived as the level of expertise of firms and builds upon cumulative knowledge stock and knowledge flows (Cohen and Levinthal, 1990; Kostopoulos et al. 2011).

The intangible nature of absorptive capacity makes it difficult to measure (Jimenez-Barrionuevo et al., 2011). However, the most common in-house measures refer directly or indirectly to firms' R&D efforts (e.g. Cohen and Levinthal, 1990; Zahra and Hayton, 2008) and to the workforce's skills level (Luo, 1997; Petroni and Panciroli, 2002).

Absorptive capacity is positively associated with innovation capacity because the ability to recognise new external knowledge and then apply it to commercial ends is crucial for innovative firms (Lundvall, 1992; Malmberg and Power, 2005). Following Cohen and Levinthal (1990: 137) the higher the level of absorptive capacity, the more likely a firm is proactive in "exploiting opportunities present in the environment, independent of current performance". Thus, organisations with a high absorptive capacity are able to better evaluate and exploit new information or ideas into innovations (Cohen and Levinthal, 1990; Kostopoulos et al. 2011; Zahra and George, 2002).

2.4.2 Size and innovation

There is no consensus in the literature regarding the relationship between firms' size and innovation (Aylward, 2006; Becheikh et al., 2006; Caceres et al., 2011, Corsino et al., 2011; Minniti, 2011). On one hand, size is stressed as a primary internal force driving innovation. Schumpeter (1942) argues that large firms tend to have greater access to capital, which enhances the employment of skilled labour, internal R&D, training, and collaboration. Looking at the benefits of R&D outputs, Minniti (2011) demonstrates that large firms are more appropriately able to enjoy the returns to their innovations. In addition, large firms tend to have a greater knowledge base, which moderates risks associated to innovation activities (Lhuillery and Pfister, 2009).

On the other hand, small firms' innovation is fostered by their greater flexibility attributed to their lack of bureaucracy and their flatter hierarchy (Freel, 2000; 2003). In addition, mitigating the potential pitfalls of limited resources and restrained access to large and foreign networks, smaller firms are more incline to join local network of firms serving largely localised markets (Freel, 2003). Freel (2000) identifies four principal barriers associated with small firms: finance, management and marketing, skilled labour and information. Moreover, the nature of the sector and competitive environment influences the relationship between size and innovation. For instance, as demonstrated by Thornhill et al. (2004) and Caceres et al. (2011) small size hampers firms' innovation activities predominantly in industries requiring high capital intensity.

2.4.3 Age and innovation

In regard to firms' age and innovation, the literature points out two opposite perspectives. The first standpointviews knowledge as cumulative, and thus considers age as associated with firms' level of knowledge base. This suggests that older firms benefit from experience and knowledge; both accumulated overtime (Corsino et al., 2011; Danneels, 2002; Teece et al., 1997). This fosters their ability to recognise and exploit new opportunities (Sørensen and Stuart, 2000; Withers et al., 2011). Withers et al. (2011) suggests that older firms benefit from more integrated and developed organisational procedures. Thisimproves both the recognition of innovation opportunities and the exploitation processes, which fosters innovativeness.

The second point of view posits thatolder firms tend to remain within their core competencies accumulated over time, which restrict the dynamism of their processes. Consequently, thismay lead to path dependency (Danneels, 2002). This rigidity could be symptomatic of the established routines and procedures impregnated in the firm's convention (Freel, 2003;Hannan and Freeman, 1984). Conversely, some authors point out the innovation potential of younger firms; these are more flexible and benefit from fresh ideas, which enhance innovation (Balasubramanian and Lee, 2008). However, firms' age might not reflect the level of management capability; founders or the top management team may have cumulated solid experience from previous innovation experience (Reuber and Fischer, 1999).

Based on the literature above, firms' innovativeness is shaped by a variety of internal factors. Despite the relative agreement among scholars on the relationship between absorptive capacity and innovativeness, literature remains unclear about the effect of size and age on innovation. Thus, this thesis contributes to the literature by examining how firms' internal characteristics influence innovativeness.

2.5 Collaboration and innovation

The literature on the relationship between collaboration and innovation stresses that firms are social entities not operating in isolation. This section first defines collaborations and its

impact on innovation. Second, it focuses on the nature of collaboration. Finally, it investigates collaborations tied specifically with HEIs.

2.5.1 Definition of collaboration

Doloreux and Mattson (2008:358) define collaboration[7] as a voluntary arrangement between "partners working actively working together to share a joint objective in the development of innovations".Collaborationis particularly relevant in today's learning and knowledge-based economy by providing an opportunity for multiple learning occasions (Baba et al., 2009; Tödtling et al., 2009).

2.5.2 What are the characteristics of collaborators?

A large size and a high absorptive capacity are generally highlightedas characteristics of collaborators (Chesbrough, 2003; Van de Vrande et al., 2009). It is argued that firms with these traits are more likely to collaborate, acquire external knowledge and diffuse external knowledge (Chesbrough, 2003; Van de Vrande et al., 2009). The rationale is that large firms with high absorptive capacity are attractive collaboration partners. A high absorptive capacity enables firms to better recognise, integrate, assimilate and apply new knowledge from external sources (Lundvall, 1992). Furthermore, some sectors might be more likely than others to collaborate. For instance, Cacère et al., (2011) demonstrate that firms from high tech-sectors (such as software, aerospace) are more likely to collaborate than firms in low-tech sectors (such as agriculture, textile).

In contrast, small firms are likely to have limited resources, which may hamper their ability to build and maintain collaboration networks as well asto enforce their property rights (Van de Vrande et al., 2009). Tether (2002) suggests that small firms are less likely to be involved in collaboration for fear of losing autonomy if collaboration arrangements are tied with a

[7]It must be mentioned that this thesis uses the terms collaboration and cooperation interchangeably.

dominant partner. Despite the considerations above, other studies argue that small firms are closely connected with their regional network (Freel, 2003). Nevertheless, small firms would greatly benefit from collaboration with external partners to overcome their limited resources and market scope (Huizingh, 2011). This suggests that collaboration may come with both great benefits and risks. In consequence, some firms may choose to be less open or collaborative than others for sensible strategic reasons.

2.5.3 Motivations to collaborate

Firms engage in innovation collaboration with external partners for different reasons. Pittaway et al. (2004) identifies six reasons to collaborate for innovation: (1) risk sharing, (2) obtaining access to new markets and technologies, (3) speeding products to market, (4) pooling complementary skills, (5) safeguarding property rights when complete or contingent contracts are not possible and (6) acting as key vehicles for obtaining access to external knowledge. However, Tether (2002) suggests that firms engagein innovation collaboration primarily for two interrelated reasons. The first is to reduce the risks associated with innovation and the second is to overcome their internal weaknesses. Thus, collaboration allows access to complementary capabilities and knowledge that firms cannot create themselves (Dahlander and Gann, 2010).

However, firms may also strategically decide to not collaborate. Casadesus-Masanell (2010) explains that firms intending to develop radical innovations might be likely to work solo in order to reduce the risks associated with undesirable spillovers, and to protect the novelty of their innovations. These authors further indicate that the choice to collaborate or not is a trade-off between the costs of losing control within innovation development over the benefits of knowledge and resources yielded in collaboration with external partners.

2.5.4 Types of partners for innovation

The type of knowledge accessed depends on the collaboration partners, which in turn influence firms' innovation. As stressed by Tödtling et al., (2009), the outcomes of

collaboration are not homogeneous but depend on the type of knowledge inputs, sources, and ties involved. On the one hand, these authors suggest that firms interacting with universities and research organisations access complementary scientific knowledge such as R&D and patent knowledge. Consequently, this leads to a higher likelihood of launching radical innovations. On the other hand, firms collaborating with service firms, customers and suppliers access market knowledge oriented towards practical matters. This type of knowledge subsequently reduces the level of novelty and fosters the likelihood of incremental innovations (Tödtling et al., 2009). The choice of collaboration partners depends on the inherent motivations. Table 1 presents the results of Tether (2002) on the motivations associated with the collaboration partners

Table 1 Motivations and collaboration partners for innovation

Innovation Partners	Motivations
Customers	Reduce risk associated to innovation by increasing risk of adoption, users behaviour, pricing strategy, complementary knowledge from customer know-how
Suppliers	Measure if firms must create themselves or buy goods or services, feasibility of innovation project, trust-building, cost-minimisation
Competitors	Standards setting, to understand each other competitive advantage, to solve common problems
Universities and government research institute	Access new scientific and technological knowledge, technical support, complement internal R&D, access to results of expensive research a at low risk and cost
Consultants	Access to applied knowledge, specialist skills and information, experience sharing, diagnostic innovation problems, parsing companies with need and solutions

Source: Tether (2002)

2.5.5 Collaboration with HEIs

The literature highlights the benefits associated with HEIs-industry linkages and their positive impact on innovation (D'Este and Iammarino, 2010; Kaufmann and Tödtling, 2001; Lee, 2000; Lendel, 2010; Tödtling et al., 2009; Lester, 2005). The following section first presents the roles and contributions of HEIs, then posits the general characteristics of HEIs collaborators, and finally depicts the impact of HEIs collaboration on innovation.

2.5.5.1 What are the roles of HEIs?

The roles of universities and colleges differ. Indeed, the purpose of colleges is to respond to the needs of the localcommunity (Doughetry and Townshend, 2006) by offering short programs typically oriented towards regional industries and businesses. As opposed to universities, colleges conduct little applied research and greatly focus on teaching. Thus, collaboration with colleges is likely to principally contribute to leverage labour knowledge and skills.

As colleges, universities aim to leverage talent flow, but focus predominantly on research and knowledge creation (D'Este and Iammarino, 2010; Kaufmann and Tödtling, 2001). Universities are attractive collaboration partners to the industry for two main reasons. First, universities may conduct basic research, which may create new and scientific knowledge.These types of knowledge offer great potential for radical innovations. If commercialised, these may lead to a great competitive advantage (Lee, 2000; Moodies, 2002). The second reason is their substantial financial resources for research. Given the costs inherent in research, universities are able to carry expensive long-term research that firms alone would not be able to conduct with their own resources (Tether, 2002). These two reasons suggest that universities are perceived as attractive partners for firms to leverage knowledge base and complement internal R&D.

2.5.5.2 Characteristics of HEIs collaborators

Some scholars highlight that a large size and a large knowledge base are prerequisites for firms to engage and to fully benefit from collaborations with HEIs (Asheim et al., 2003; Kaufmann and Tödtling, 2001; Tödtling et al., 2009). In addition, some innovation activities conductedat the firm level are associated with HEIs collaboration. For instance, Tödtling (2009) identify that firms conducting R&D are more likely to be engaged in HEIs collaboration. However, the relationship between firms' sector and their propensity to collaborate with HEIs remains unclear in the literature. For instance, some scholars indicate

that firms from the high-tech sector are more likely to collaborate with HEIs (Asheim and Gertler, 2005; Cooke et al., 2007), but this link is not found by others (Tödtling et al., 2009).

2.5.5.3 Impact of HEIs collaboration

As demonstrated by the works of Kaufmann and Tödtling, (2001) and Tödtling et al., (2009),firms collaborating with HEIs have a higher propensity to develop breakthrough innovations. The rationale is that scientific knowledge created in universities offerhigh potential for product innovations.

Meanwhile, HEIs impact goes beyond firms. This is, given that HEIs may also contribute to leverage the regional knowledge base (Kaufmann and Tödtling, 2001). The work of Berglund and Clarke (2000) attributes the positive impact of HEIs at the regional level to the following:

1. Contribute to build an intellectual infrastructure that generate new ideas, for example by strengthening the R&D capacity of the region
2. Fosterknowledge spillovers and commercialisation of newly developed technology, for instance by the commercialisation of university-developed technology, and access to federal laboratories;
3. Educate a skilled workforce by delivering courses, training and seminars;
4. Provide adequate information flows around sources of investments;
5. Increase the quality of life by the wage offered to the university personnel and by the residential facilities.

The presence of HEIs may raise the region's attractiveness for economic actors such as "firms and educated individuals who may want to locate close by, as well as financiers, entrepreneurs and for others seeking to exploit new business opportunities emanating from the campus" (Lester, 2005:7). Other studies suggest that the local impact of HEIs spin-offs includes the stimulation of: business support services, infrastructure (Zang 2008), start-ups (Lockett et al. 2005), knowledge spillovers, and employment (Acs 2009).

However, some cautions must be acknowledged with regards to HEI-industry collaborations, because not all externalities are positive. This is, given that HEIs collaborations may raise issues caused by conflicting objectives of entrepreneurs and academics. For instance, within the appropriation and use of knowledge, firms usually desire the exclusive rights on their creation, while universities prefer the wide diffusion for academic recognition (Guiliani and Arza, 2009). Moreover, some scholars argue that the presence alone of HEIs in a given region does not automatically imply collaboration and engagement at the regional level. Indeed, apart from wages that are likely to be spent in the regional economy, there is no guarantee that the knowledge and value created by the HEIs will remain in the host region (Power and Malmberg, 2008). In consequence, it is argued that HEIs might only be a latent asset and these might have a modest impact to the regional development (Laursen et al., 2011; Power and Malmberg, 2008).Therefore, collaboration with HEIs generally appears as a valuable asset for firms' innovation, but the impact of HEIs at the regional level remains unclear through literature.

Overall, firms collaborate for innovation with external partners generally to access complementary knowledge and to reduce the inherent risks. The types of knowledge accessed through collaboration depend on the type of partners, which consequently influence innovation. Providing scientific knowledge, universities are typically considered as highly valuable partners given that they enhance firms' likelihood to develop breakthrough innovations. Given the relatively young age of the Canadian wine industry, collaboration with HEIs might be particularly relevant to leverage the industry knowledge base. This thesis investigates that particular matter.

2.6 The role of the region

Over the last two decades, an increasing body of literature considers regions as the locus of innovation (Cooke and Leydesdorff, 2006; Doloreux, 2002; Fritsch and Schroeter, 2011; Hassink, 2005; Tödtling et al., 2011; Uyarra, 2009). First, this section briefly defines regions.

Second, it examines the regional mechanisms driving and supporting innovation. Finally, it describes some factors accountable for the innovation disparities among regions.

2.6.1 What is a region?

Exploring the role of a region underlines that innovation is a territorial process shaped by the arrangement and interaction of regional actors. (Doloreux, 2002). There are two main ways to define regions in institutional terms (Cooke et al., 1997). The first one views the region as "cultural", which refers to an area characterised by a common culture, language, which might not "become states (e.g. the Basque Country) or forfeited status (e.g. Scotland)" (Cooke et al., 1997: 479). This perspective is similar to the concept of embeddedness by focusing on social ties and considering the interactive and collective learning among actors (Doloreux, 2002).

The second one refers to "administrative" region by considering policy organisation (Cooke et al., 1997). This perspective allows the examination of the governance and the institutional structure. For instance, administrative regions are Wallonia and Flanders from Belgium and the provinces in the case of Canada. Therefore, by considering three provinces in terms of region, this thesis looks at region in administrative terms.

2.6.2 Regional factors influencing innovation

This section examines some mechanisms driving and supporting innovation that happen at the regional level. It first explores the notion of proximity, then agglomeration and finally knowledge spillovers.

2.6.2.1 Geographical proximity and other forms of proximity

The examination of innovation within regions stressed the geographical proximity of actors. Geographical proximity may generate localisation economies, which are a reduction of costs associated with knowledge sharing. Localisation economies are beneficial in easing and

speeding up the communication process (Appold, 1995; Doloreux, 2002) as well as in promoting the interaction frequency of actors (Doloreux, 2004).

Proximity emphasises the tacit knowledge sharing and learning among co-localised actors (Ashiem et al., 2011; Ashiem and Gertler, 2005; Maskell and Malmberg, 1999). Tacit knowledge refers to knowledge embedded in know-how and practices shared through interpersonal, face-to-face contacts, which do not travel easily across distance. Given its sensitivity to spatial distance, tacit knowledge is enhanced through geographical proximity. In contrast, codified knowledge refers to knowledge stated in an explicit form, which can be easily transmitted though information technology and over distance (Maskell and Malmberg, 1999).

Nevertheless, Boschma (2005) argues that proximity is not only geographical, but may be also cognitive, organisational, social, and institutional. The author posits that these kinds of proximity influence innovation. With regards to cognitive proximity, Boschma (2005) build on absorptive capacity literature (Cochen and Levintal, 1990) and suggests that knowledge is effectively transferred among actors with a similar knowledge base. In this perspective, a reduced knowledge gap among actors enhances communication, understanding, absorption and processing of new information successfully. However, Boschma (2005) notes that if too much cognitive distance may hamper communication among actors, too much cognitive proximity might reduce innovation novelty.

Regarding organisational proximity, Boschma (2005) defines it as the capacity to control and coordinate knowledge exchange either within or between organisations. Organisational proximity reduces uncertainties emerging from knowledge creation by ensuring ownership rights and rewards. If organisational proximity is beneficial to organisational learning and innovation, too much may lead to bureaucracy (Boschma, 2005).

Social proximity is defined as trust within social relationships (Boschma, 2005). Perceived as a prerequisite for interactive learning, social proximity is closely associated to close ethnic and religious values as well asto a common culture. While great social proximity fosters tacit

knowledge exchanges and reduces the likelihood of hostile behaviour and communication purely based towards economic rationale, too much may reduce the level of innovation novelty.

Institutional proximity embeds economic actors within similar institutional rules and sharing a common set of behaviours such as language and culture (Boschma, 2005). Similarly to social proximity, institutional proximity enhances trust among actors, which fosters interaction among them. However, too much institutional proximity might leads to technological lock-in caused by a lack of renewal of ideas.

If geographical proximity generally embraces other kinds of proximity, Boschma (2005) restricts its definition to a reduced spatial distance among economic actors. He posits that geographical proximity may facilitate knowledge exchange but this is not a sufficient condition for learning to automatically occur among actors. The author further argues that other kinds of proximity might substitute geographical proximity. As suggested by Shearmur (2011: 1229), geographical proximity may only "facilitate the acquisition of information so a firm can thus be understood from a variety of perspectives, and there is no reason to give pride of place to geographic proximity: social and other types of proximity can be effective over large distances, although geographic proximity may be more important for informal and unexpected interactions". Therefore, economical actors might exchange knowledge at a higher spatial level if they share other kinds of proximity.

However, co-localisation might not be sufficient to explain the regional innovation dynamics. Bathelt et al., (2004) suggest that the most favourable regions for innovation are enjoying a high level of regional interaction (local buzz) and have the physical infrastructure to access actors located elsewhere (global pipelines).Knowledge accessed from broad spatial sources foster the regionalknowledge exchange dynamics. The ideal situation of local buzz and global pipelines enables firms to exchange both tacit and codified knowledge at both the regional and international scale.

With respect to the literature above, geographical proximity is highlighted as fostering tacit knowledge exchange among actors. Nonetheless, geographical proximity embeds other kinds of proximity, which may enhance interactions among actors. Also, local networks are more dynamic when regions possess infrastructure to access knowledge from elsewhere.

2.6.2.2 Agglomeration economies

The second regional factor is agglomeration economies, which are the benefits associated with an important critical mass of economic actors located in an urbanised area. The advantages for firms located in agglomerations include geographical proximity to: a large market, a broad range of suppliers, a wide range of service providers, a developed infrastructure, a qualified workforce, and a developed institutional framework (such as universities and governmental agencies) (Fitjar and Rodriguez-Pose, 2011; Shearmur and Polèse, 2003). Simmie (2005) suggests that the key dimension of agglomerations is size. According to Fitjar and Rodriguez-Pose, (2011:558), large agglomerations have "better endowments of physical and human capital and with a greater density of top universities and research centres tend to innovate more and to generate greater knowledge spillovers, which in turn, contribute to the creation of virtuous circles of innovation". Thus, literature concurs that agglomerations have more innovation capacities such as human and physical capital. Consequently,these are centre of the major product innovations, R&D activities and patenting (Fitjar and Rodriguez-Pose, 2011; Leamer and Storper, 2001; Simmie, 2005).

In contrast, firms located in less-urbanised regions face challenges like the absence of a critical mass of businesses, public organisations, knowledge infrastructures, and knowledge intensive activities (Doloreux and Dionne, 2008). Tödtling and Trippl (2005) posited that less-urbanised regions have less developed institutional prerequisites, less dynamic clusters (often of traditional industries) and less support organisations. Thus, innovative performances of less-urbanised regions are generally modest in comparison to large agglomerations.

However, regional innovation might not be as simple as the dichotomy agglomeration/less-urbanised regions. Indeed, the works of Shearmur, (2012) and McCann, (2007) posit that since regions are not isolated islands, accessibility among them must be acknowledged. The accessibility of regions refers to their physical infrastructure and spatial distance among them. In addition, the access to a region possessing global pipelines also influences innovation of firms positively (Shearmur, 2008). In this case, access to resources from elsewhere could overcome the regional context. Thus not only the regional infrastructure matters, but also the "region's physical accessibility to the entry points of global pipelines" from agglomerations (Shearmur, 2008:26).

Based on the literature above, a critical mass of actors, the presence of institutions, and the physical infrastructure are characteristics inherent to agglomeration and influence innovation. This suggests that firms located in large agglomerations have more favourable innovation conditions than firms located elsewhere. Meanwhile, accessibility of firms located in less-urbanised areas to agglomerations also influence innovativeness.

2.6.2.3 Knowledge spillovers

The third regional factor, knowledge spillovers, expresses that the benefits of innovation outreach the actor's boundaries that initiated it (Jaffe et al., 1993). In other words, knowledge created by one or few actors that invested in research or technology development will benefit others (Breshi and Lissoni, 2001). The notion of spillovers underlines individuals from interconnected organisations that share non-rival knowledge through mobile labour or through informal contacts (Feldman, 2000). Knowledge spillovers are considered as bounded in space because co-localisation of actors fosters trust, the level of face-to-face interaction and tacit knowledge exchange. Accessing complementary knowledge, co-localised firms sharing prior knowledge may introduce innovations at a faster pace than firms in isolation (Krugman, 1991; Breshi and Lissoni, 2001). Therefore, knowledge spillovers play an important role in industries where tacit knowledge is important (Audretsh, 1998).

Knowledge spillovers might be intentional or not. As posits by Breshi and Lissoni (2001) unintentional spillovers may occur when others imitate an innovation, while intentional spillovers may happen when scientists divulge research results. In addition, the effect of spillovers differs whether knowledge in diffused or accessed (outflow vs. inflow). As Iammarino and McCann (2006) suggest, knowledge inflows have positive externalities to a large extent. However, knowledge outflows might provide positive or negative externalities whether its diffusion is unintentional. If unintentional, outflows are considered as negative by the agent, which may lose important intellectual capital. However, from a regional standpoint, unintentional knowledge outflows might be positive by strengthening the regional knowledge base. In turns, this may fosters the regional development and competitiveness.

In the sum, regarding the region as the locus of innovation involves acknowledging many mechanisms driving and supporting innovation. This section presented and explained the extent to which;proximity, agglomeration economies and knowledge spillovers may influence innovation. These concepts are used as foundations to the next section, which explores the innovation variations among regions.

2.6.3 Variation of regional innovation performance

This section elaborates on the second objective of this section by examining the innovation difference among regions. Why do some geographic areas generate more innovations than others? Three factors are examined as possible explanations for regional innovativeness disparities: clusters, institutional framework, and regional innovation systems.

2.6.3.1 Clusters

A cluster is described as a concentration of industrial activities within a region and denotes that local competition forces firms to innovate in order to either become or maintain their competitive position (Porter, 2003). According to Porter (2000:254), a cluster is defined as a "geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities". In other words, a cluster

is a critical mass of economic actors related to a common industry. These actors are linked by voluntary ties (vertical or horizontal), which drive the collective benefits of competitiveness within a given geographical space.

Advantages of clusters include the promotion of interaction among interconnected economical actors and thereduction of transaction costs. Moreover, clusters are breeding grounds for knowledge spillovers because these are composed of actors sharing a common knowledge base (Breshi and Lissoni, 2001; Feldman, 2000; Jaffe et al., 1993). Clusters may also foster labour force efficiency, by attracting and training a local pool of skilled workers (Malmberg and Power, 2005).This attraction occurs since specialised labour is likely to move to the best-suited area for its competencies, in spite of its location (Bienkowska et al., 2011). While training happen via HEIs offering products and services suited to the cluster's needs (Rosenfeld, 2000; Strother et al., 2004).

However,Martin and Sunley (2003) highlight some important negative effects of clusters such as: technological isomorphism, labour cost inflation, inflation of land and housing costs, widening of income disparities, over-specialisation, intuitional and industrial lock-in, local congestion and environmental pressure. In addition, Breshi and Lissoni (2001) point out some advantages of firms for not being located within a cluster. For instance, firms can safeguard their privacy and may introduce new products before their competitors. In addition, these authors highlight that isolation may reduce social obligations to collaborate with local actors. For instance, without pressures from actors within a same cluster, firms can more easily allocate resources to support more optimum activities such as outsourcing, just-in-time methods, and R&D.

Nevertheless, innovativeness is uneven among clusters. Among the factors influencing innovation performance of cluster, the sector is an important determinant. Malerba, (2004) suggested that innovativeness might vary according to sectors because of their specific knowledge base, technologies, and inputs. For example, clusters of high technology sectors

might be more innovative by introducing to greater extent radical innovations in comparison to low-tech sectors.

The industry life cycle stage is also an important element to the cluster innovation performance. Clusters in early stages of development appear as more innovative given their abundant spillovers and strong attraction to new economic actors (Kukalis, 2010). However, when an industry reaches a maturity stage, cluster innovativeness decreases. Likewise, Tödtling and Trippl, (2005) describe old industrial regions as locked-in an overspecialised industries declining. This type of cluster is path-dependent on its obsolete technological trajectories. Consequently, old industrial clusters experience problems such as functional lock-ins, cognitive lock-ins and political lock-ins.

2.6.3.2 Institutional context

The second factor responsible for regional innovation disparities is the institutional context. Institutions represent the set of rules and policies as well as the organisations engaged in the production and diffusion of knowledge and skills (Ryans et al., 2000; Tödtling and Trippl, 2005). This suggests examining the role and impact of institutions as well as the policies and rules in shaping regional innovativeness (Asheim et al., 2003; Cooke et al., 2000; Power and Malmberg, 2008; Tödtling and Trippl, 2005). The policies, competencies and institutions are partly bounded by regions, and ideally, have sufficient regional autonomy to develop and manage innovation policies (Cooke et al., 2000).

With respect to organisations within the knowledge infrastructure, Tödtling and Trippl, (2005:1205), include the following elements: "public research institutions, technology mediating organisations (technology licensing offices, innovation centres, etc.) as well as educational institutions (universities, polytechnics, vocational training institutions, etc.) and workforce mediating organisations". The partnership and the various consortia among these organisationsinfluence regional innovation (Ryan et al., 2000). Indeed, the level of development and cohesiveness of institutions are stress as factors influencing regional innovation. With respect to the regional development, regions with a specialised structure of

knowledge suppliers and educational institutions are depicted as more innovative. While in contrast, less-developed regions are characterised by institutional "thinness" defined by a lack of dynamic clusters and support organisations, which negatively impact the labour force's qualification level (Tödtling and Trippl, 2005). Therefore, the literature on institutional framework posits that top down strategies (such as policies) as well as the level of density of actors within a same territory influence the level of knowledge generated and diffused, which in turn, may influence innovation.

2.6.3.3 Regional innovation systems

The third and last factor examined as explanation for innovation variations among regions is the regional system of innovation (RIS). Asheim et al., (2011: 878) posited that RIS emphasised the "economic and social interactions between agents, spanning the public and private sectors to engender and diffuse innovation within regions embedded in wider national and global systems". Innovation network includes firms, institutions, knowledge infrastructure, and innovation policy (Doloreux, 2002). The arrangement and interaction of these four elements shape the innovation and economic performance of regions.

The RIS explains innovation as an interactive process shaped by firm's internal capabilities and its external environment (Tödtling et al., 2011). With respect to the external environment, the RIS examines a variety of regional mechanisms driving and supporting innovation, such as: geographical proximity (emphasising tacit knowledge exchange), knowledge spillovers, and agglomeration. It also acknowledges the region's particularities such as clusters, and institutions. Moreover, the RIS acknowledges the industry's evolution by considering the four stages of life cycle (Utterback, 1996). Thus the RIS "propose a theoretical framework in evolutionary economic geography for the analysis of spatial clustering in an industry based on the co-evolution of firms, industries, clusters and networks over time"(Asheim et al., 2011: 885).

The RIS approach provides some explanations for the innovation disparities among regions based on whether they possess high or low RIS potential. Conceptually, a RIS represents an

"ideal" profile of systemic innovation, networking and learning capacity. In theory, regions can be a system or not (Cooke et al., 2001). As pointed by Uyarra (2009), very few regions respect the conditions of the RIS[8] (RIS conditions are presented in Table 2). In realistic terms, a RIS represents what a region should be aiming for: the more similar is a region to the concept, the closer it is to be a RIS. In other words, RIS provides a benchmark of the desirable systemic innovation at the regional level. Initially presented by Cooke et al (1997), the RIS conditions can be classified into infrastructural and superstructural (see Table 2).

Conditions focus on the regional financial capacity, institutionalised learning and productive culture to systemic innovation. With respect to the infrastructure level, conditions focus on the higher potential RIS have more autonomy on their taxes and spending, they have regional private finance, policy influence of infrastructure, regional university-industry strategy. While the conditions at the superstructural level emphasise the regional culture and systemic relations at the institutional and organisation level (Cooke et al., 2001).

Some regional preconditions and governmental interventions are required for the well functioning of a RIS (Asheim et al, 2011; Uyarra, 2009; Cooke et al., 2004; Tödtling and Trippl, 2005). With regards to the preconditions, these include: the dynamics of clusters (old industrial vs. growing cluster) (Tödtling and Trippl, 2005), the harmonisation of institutions (fragmented vs. integrated) (Tödtling and Trippl, 2005,), and size of agglomeration (less-urbanised vs. agglomeration) (Cooke et al., 2004, Tödtling and Trippl, 2005).A RIS implies that the performance of regions vary according to its capacity to develop location specific competitive advantages (Maskell and Malberg, (1999). Therefore, some policies and institutional frameworks might be better than others to foster regional innovation (Asheim et al, 2011, Uyarra, 2009).

[8] Accoding to Cooke et al., (2000), only Wales, Baden-Württemberg, Basque and Styria meet the RIS conditions and Doloreux and Parto (2005) suggest only three regions fitting the requirements RIS: Silicon Valley, Emilia-Romagna and Baden-Württemberg.

However, there is an ongoing debate on whether a region is the appropriategeographical scale for innovation and suggests that a nation might be more relevant. The rationale is that a set of key institutions is governed at the national level such as "education systems, welfare regimes, labour markets and financial system may be more or less supportive of the micro-structure (region)"(Lundvall, 2007:117). Thus, Lundvall (2007) questions whether the notion of national innovation system can be downscaled to a regional innovation system. In addition, Polèse (2005) argues that it is difficult to disentangle the impact of agglomeration from a nation, and thus suggests that nation is the most appropriate scale.

Table 2 Conditions for higher and lower RIS potential

Higher RIS potential	**Lower RSI potential**
Infrastructural level	
Autonomous taxing and spending	Decentralised spending
Regional private finance	National financial organization
Policy influence on infrastructure	Limited influence on infrastructure
Regional university–industry strategy	Piecemeal innovation projects
Superstructural level	
Institutional dimension	
Co-operative culture	Competitive culture
Interactive learning	Individualistic
Associative-consensus	Institutional dissension
Organisational dimension (firms)	
Harmonious labour relations	Antagonistic labour relations
Worker mentoring	Self-acquired skills
Externalization	Internalisation
Interactive innovation	Stand-alone R&D
Organisational dimension (policy)	
Inclusive	Exclusive
Monitoring	Reacting
Consultative	Authoritative
Networking	Hierarchical

Source: Cooke et al., 2001

Overall, this section demonstrated that regions might influence the efforts of firms to generate competitive advantages and innovation. Regional innovativeness may depend on the performance of clusters, institutional infrastructure, and RIS potential. This section highlighted the literature questioning the relevance of the regional context on firms' innovativeness. The arguments are based on the fact that firms might overcome their regional

context by interacting with actors located elsewhere. Indeed, firms might look extensively for the best-suited partners, regardless of their location. In this case, accessibility to global pipelines might be more important to innovation than the regional context.

2.7 Conclusion

Since the 21th century, innovation is stated as a key driver of prosperity and growth. This has encouraged academics to develop innovation models to better understand and manage innovation. Innovation models have evolved from linear to a more open one through the years, shifting attention from basic research to the importance of social interactions. Innovation can take many forms that can be classified as technological and non-technological. Not all innovations have the same degree of novelty: generally innovations are incremental and to a lesser extent radical.

This chapter has presented the extent to which firms' characteristics, collaborations, and region may influence innovation. Regarding firms' characteristics, there is no consensus on the ideal traits for innovation. Indeed, results differ across sectors, regions and studies. As an important element of the interactive innovation model, collaborations and interactions with external partners are important to the innovation learning process. The partners for innovation appear to influence the type of innovation develop. HEIs are highlighted as valuable innovation partners to leverage the innovation capacities of firms and regions. In addition, literature indicates that all regions are not evolving similarly given their unique background and context. Thus, regional innovation is shaped by their prior conditions as well as by their ability to manage the mechanisms driving and supporting innovation. However, it is argued that firms might not be dependent on their regional context if they can access and learn from actors located elsewhere.

3 KEY EMPIRICAL FINDINGS ON THE WINE INDUSTRY

3.1 Introduction

Interesthas grown amongst scholars regarding different aspects of the wine industry, such as marketing (Gundlach and Neville, 2012; Madill et al., 2008; Thach, 2012), climate change (Diffenbaugh et al., 2011; Jones, 2012; Malheiro et al., 2010), tourism (Barber et al., 2010; Clemente-Ricolfe et al., 2012; Dawson et al., 2011), and innovation (Alonso, 2010; Aylward, 2004; Cusmano et al., 2010; Giuliani, 2007). This thesis focuses on innovation perspective, and examines two relevant themes: (1) the factors associated withthe development and growth of wine producing regions, and (2) the characteristics of firms and wine producing regions that influenceinnovation and collaboration.

3.2 Wine producing regions

While investigating wine producing regions, scholars from the field of economics and geography (almost always) referto the concept of a cluster[9].The factors of development and growth of wine clusters are associated withthe notion*terroir*. This includes the interaction of physical and environmental factors with human factors such as heritage, know-how and culture embedded in a given area (Goulet and Morlat, 2011). According to the International Organisation of Vine and Wine (Resolution OIV/Viti 333/2010*) terroir* refers to an "area in which collective knowledge of the interactions between the identifiable physical and biological environment and applied viticulture practices develops, providing distinctive characteristics for the products originating from this area". This section examines the extent to which physical and human conditions influence the development and growth of wine producing regions.

[9]If this thesis is considering the wine producing regions of Canada, the findings presented in this section refer to wine clusters to remain coherent with the typology used in the literature.

3.2.1 Physical conditions

Not all geographical areas are suitable for grape growing. Firms typically cluster in an area that has favourable physical and environmental factors such as climate, soils, grape varieties, rootstock, and the availability and quality of water for grape cultivation (Muelle and Summer, 2006; Ditter, 2005; Gade, 2004).

The types of vines that are cultivated are highly related to the environmental conditions. For instance, *vinifera* vines are traditionally cultivated in European countries and their wines are considered noble. However, this type of vine is fairly sensitive and does not thrive inhighly humid, cold or warm conditions (Alonso, 2010; Greenspan et al., 2005). Thus, in areas where *vinifera* varieties do no thrive, hybrid varieties are produced. These varieties are adapted to the regional climate, but their wines are different from the global wine tasting standards.

Alonso (2010) stresses that the type of grape cultivated appears to influence the innovation dynamics and specifically the configuration of collaborations. Investigating the Southern American wine growing regions, he explains that wineries that cultivate hybrid vines face common challenges and must collaborate for recognition purposes, namely for marketing and tourism promotion. Arguably, the distinct character of hybrid wines push producers to co-operate towards common goals and benefits. In addition, the unique characteristics of hybrid varieties imply specific growing techniques, which may restrain the potential collaborators in product innovation outside the region.

This suggests that the physical conditions and inherent growing characteristics influence innovation dynamics of the wine producing regions. However, viticulture and oenological practices are human activities necessary to optimise the wine production (Van Leeuven and Seguin, 2006).

3.2.2 Human factors

Innovation in wine-producing regionsalso depends on how the natural environment is exploited by human. This section examines the extent to which the wine growing tradition and institutional framework influence the innovation dynamics.

3.2.2.1 Winemaking tradition

The winemaking tradition is highlighted as a determinant of firms' innovation dynamics. Indeed, the winemaking tradition underlines social conventions, which may shape innovation. Gilinsky et al. (2008) show that social conventions, such as culture, influencethe decision making related to innovation. These authors conducted a comparative case study of two wine-producing regions (California and Tuscan) and showedthat many fundamental differences exist between these two areas. The authors concluded that the winemaking history influences business decisions, especially the perception of tradition, innovation, level of family involvement, level of human resource training provided, strategic orientation and targeted market segmentation. In addition, the winemaking tradition shapes the institutional framework.

3.2.2.2 Institutional framework

The institutional framework can positively or negatively influence innovation in wine producing regions. Some differences are notable between the institutional framework of Old World Wine country producers and New World Wine country producers. New World Wine country producers may benefit from a better institutional framework, because of government top-down strategies. As suggested by Cusmano et al., (2010) the late introduction of these countries to the wine industry has allowed their governments to coordinate the industry growth and adapt it to the current wine market. Indeed, this is one of the key empirical findings of Aylward (2004) and Aylward and Turpin (2003). They posit that the success in the wine industryin Australia and South Africa is largely attributed to their similar institutional framework, which is nationally centralised. For these countries, the national government coordinates both the wine industry policies and public organisations. The

authors expressed that the government sets a long-term vision, which is market-driven, and focuses on innovation for strengthening the business environment.

In contrast, the institutional framework of traditional wine country producers is more likely to be fragmented and path dependent. Based on their empirical findings from Italy, Cusmano et al., (2010:1598) suggest:

> *"The institutional picture is one of a greater and persistent fragmentation, which results from the historical differentiation of traditional wine regions and from the competitive relevance of local specificities. […] European producers have to satisfy numerous restrictions on which grape varieties can be used in an appellation, on maximum yield and alcohol content, on vine density, and on irrigation systems. Local wine industries are generally embedded in a dual layer of regulation—national level, especially in the appellation wines categories (DOC and DOCG), and European level within the framework of the Common Agricultural Policy".*

Similarly, the empirical findings of Bell and Giuliani (2007)indicate that the regulatory environment of the Italian wine industry is strict and could potentially hinder the industry's responsiveness to the market.

Meanwhile, within the same country, the level of integration of institutions at the cluster level influences innovation. For instance, looking at the relationship between the innovation level of Australian wine firms and the cluster level of development, Aylward (2004) argues that the more developed and concentrated the cluster, the more innovative firms are. Moreover, McDermott (2007) posits that the regional governance of Menzola and San Juan wine-producing regions isthe main exploratory factor for their level of development disparities.

Furthermore, collaboration amongst actors within a cluster also influences innovation. For instance, the presence of large firms has positive outcomes on regional innovation and development. Examining wineries located within North Carolina, Taplin and Breckenridge

(2008) suggest that firms located in the proximity of large wineries benefit from co-location advantages. Indeed, these authors demonstrate that the four largest wineries of the state established quality parameters by introducing the minimal acceptable standards of production. In addition, large wineries are key players in the region's industry by virtue of the fact that they lead activities, establish relationships partners at a broad geographical scale, utilise economies of scale, and attract skilled workers from abroad. Thus, these findings suggest that large firms contribute to build the cluster's business practices and as a result promote organisational development.

HEIs are also identified as valuablepartnersin leveragingthe innovation capabilities of regions. The key argument is that HEIs strengthentheindustry's knowledge base by creating and diffusing scientific knowledge inside wine producing regions (Cusmano et al., 2010). Thus, firms thatcollaborate with them adopt a technology-push approach, and seek complex product innovation (Dell'era and Bellini, 2009). Exploring the cases of Italy, Chile and South Africa, Cusmano et al., (2010) argue that alumni working in the industry as oenologists or agronomistsplay the role of gatekeeper by linking the industry to universities.

In addition, Tiffin and Kunc (2011) highlight the positive outcomes of universities in the wine industry of Ontario at both the firm level and at the regional level. They argue that universities provide adapted services and technologies for their regional stakeholders such as:training, research, consulting services,firms' creation, and networking activities. In addition, universities enhance the overall regional knowledge base, and directly support technological change and development. They demonstrate that the HEIs are especially important for small and medium firms, which do not have the in-house capabilities to create far-reaching knowledge.

Similarly, Velluzzi (2010) explores the role of the Walla Walla Community in Washington in shaping the competitiveness of the industryand regional economic development. He emphasises that the college acts as a market intermediary by educating skilled labour and by connecting the students to the wine industry stakeholders. Veluzzi (2010) also adds that the

college increases the region's attractiveness, facilitates the establishment of new firms and fosters demand in the labour market.

Thus, the empirical findings above suggest that HEIs contribute to reinforce the cluster's scientific knowledge base by raising the skills and absorptive capacity of the wine industry. The importance of HEIs is emphasised for new world wine country producers. This might bethe result of a lack of cumulated knowledge within new world country producers, which needs to catch up to meet the global market conditions.

In sum, wine-producing regions are to a great extent studied as clusters. Given that wine industry clusters are closely associated to the notion of *terroir,* this section has presented the importance of physical and human conditions on the development and innovation dynamics.Physical conditions include the broad range natural factors that determine the type of grapes cultivated. On the other hand, human conditions refer to the collective learning and know-how required for the wine production. These include the winemaking tradition and the institutional framework.

3.3 Determinants of collaboration in wine producing regions

The value of collaboration in innovation is emphasised by studies on the wine industry (Alonso, 2010; Cusmano et al., 2010; Dell'era and Bellini, 2009; Giuliani, 2007; Morrison and Rabelloti, 2009). Among other things, collaboration enables an exchange of complementary knowledge and leverages innovation capabilities. Collaboration and diffusion of knowledge rely on the characteristics of both firms and clusters. This section first presents the extent to which firms' absorptive capacity influences their position within the cluster network. Second, it highlights how the cluster's stageof development influences the network of firms.

3.3.1 Absorptive capacity

Scholars concur that the absorptive capacity of firms influences not only their innovative performance, but also with whom they collaborate (Giuliani and Bell, 2005; Giuliani and

Bell 2007; Giuliani 2007; Morrison and Rabelloti, 2009). For instance, Bell and Giuliani (2005) show that at the cluster level, knowledge is diffused within a core group of firms with high absorptive capacity. They explained that wineries with a strong absorptive capacity are likely to be perceived as technological leaders within their area. Consequently, theiradvice and knowledge are more sought after, within their regions.

Based on results from Chile and Italy, Giuliani (2007) advocates the importance of absorptive capacity, by demonstrating that firms with a higher cognitive capacity are more likely to acquire knowledge and know-how from outside the cluster. She argues that firms are more likely to collaborate with others sharing cognitive proximity rather than geographical proximity for a reciprocal knowledge exchange. As a result, those with lower absorptive capacity have a tendency to become isolated.

Similarly, findings by Morrison and Rabelloti (2009) demonstrate that large Italian wineries with high absorptive capacity are more likely to collaborate with partners outside their region. These authors explain that firms with high absorptive capacity are not interested in collaborating with small firms, even though located within their region. In consequence, large firms with a high absorptive capacity contribute very little to regional learning systems since they diffuse very little knowledge within the region. This suggests that the presence of firms with high absorptive capacity has a limited impact on a region's development and innovation.

Based on the considerations above, the level ofa firm's absorptive capacity appears toinfluence the spatial scale of collaborations. Even though the wine industry is closely associated to its regional context, it seems that cognitive proximity, rather than geographical proximity, is an important predictor of collaboration among actors.

3.3.2 Stage of development

The wine industry network configuration varies according to the cluster's stage of development(Alonso, 2010; Beverland and Lockshin, 2001; Taplin, 2011). Following

empirical results of Alonso (2010) and Taplin (2010), wine-producing regions in early stages of development are characterised by friendly linkages among wineries. Duringthis stage, tacit knowledge is exchanged through informal knowledge channels. These authorsalso agree that the need for recognition motivates collective organisational learning among firms. However, when wine clusters gain legitimacy, rivalry among firms increases, while the knowledge shared is codified and exchanged through formal channels (Taplin, 2011). Therefore, the cluster context andthe stage of developmentinfluence the frameworkof collaboration within cluster.

Overall, empirical results suggest that the cluster's context along with its developmental stage is important to consider within the collaboration framework. In addition, firms are likely to collaborate with actors that share cognitive proximity, regardless of their location.

3.4 Conclusion

The key empirical findingsof the studies presented above suggest two important insights.Firstly, it highlights that the regional conditions are important determinantsof a firm's innovativeness. Since the wine-growing context is associated with the notion of *terroir,* we must examine both the natural and human conditions of the Canadian wine industry.The case ofCanada is of a particular interest because the three wine-producing regions might have dissimilar conditions. Thus, thisthesis contributes to the literature by comparing the development and innovation of three wine regions characterised by different physical and human conditions.

Second, the literature presented above suggests that some characteristics of firms, such as absorptive capacity and size, are preconditions to collaborate withactors outside the region.Since collaborations are highlighted as crucial to the collective learning process, this thesis examines the collaboration patterns of the Canadian wine industry. Furthering these results, this thesis explores the impact of collaboration on innovation on different geographicscales (regional, national and international). The relative importance of different types of partners is additionally considered. Moreover, given the recent emergence of

Canada within the wine industry, it is reasonable to assume that the industry has limited cumulated knowledge.Given that collaborations may enhance collective learning,they are crucial to leverage the industry's knowledge base and development. With respect to the relevance of HEIs as collaboration partners, this thesis emphasisesthis type of partner.In light of the literature on innovation and the key empirical findings from the wine industry, the next chapter presents the expected outcomes of this thesis.

4 EXPECTED OUTCOMES

4.1 Introduction

A central issue in this thesis is to understand innovation in the Canadian wine industry. The previous chapters presented a literature review on innovation and then described the key empirical findings related to the wine industry. The literature has a considerable gap between innovation studies addressing patterns of innovation at the firm level, and empirical evidence supporting these innovation patterns in the context of the wine industry.

This chapter presents the expected outcomes with respect to the relationship between innovation and the characteristics of firms, the nature of collaboration and the wine-producing regions.

4.2 Innovation and characteristics of firms

Studies on innovation tend to suggest that innovation is affected by the firms' characteristics. The main assumption of these studies is that patterns of innovation are contingent on firms' different characteristics. Thus, firms' characteristics may influence the different strategies associated with innovation, such as innovation activities, innovation development, sources of knowledge, and innovation barriers (Becheikh et al., 2006). With respect to the wine industry as in the context of this study, innovation may depend of the size of firms. Small and young firms have been described as being highly innovative with respect to product and process innovation in order to catch-up with the world wine products against those that compete in their local market (Cusmano et al., 2010). Moreover, innovation may also vary with the type of production. Firms growing *labrusca* and hybrid grapes varieties may be more isolated from other producers located elsewhere and therefore may have to conduct all the necessary steps to innovation themselves (Alonso, 2010).

Based on these arguments about the characteristics of firms and innovation, Hypothesis 1 was formulated:

H1: Innovation will differ according to firm's size, age and type of production.

4.3 Innovation and collaboration

A great deal of the literature has focused on the importance of collaboration to explain innovation (Baba et al., 2009; Chesbrough, 2003; Tödtling et al., 2009; Van de Vrande et al., 2009). Modern conceptualisations of innovation focus on the importance of interaction between firms and other external actors such as clients, suppliers and institutional organisations like universities and governments (Tödtling et al., 2009). Previous research on collaboration lends to support that firms engage in collaboration have a higher propensity to introduce product, process and organisational innovations. Since innovation is not an isolated phenomenon, we anticipate that collaboration is important in the context of the Canadian wine industry to complement new skills and knowledge. Subsequently, we anticipate firms engage in collaboration to be more innovative. Moreover, given the recent age of the Canadian wine industry, it can be assumed that the wine-producing knowledge base is rather limited and consequently, firms will engage in collaboration with different partners. Thus, we expect the benefits of collaboration to be greater when the firms collaborate with HEIs, as they provide critical and scientific knowledge that firms cannot create themselves (D'Este and Iammarino, 2010; Kaufmann and Tödtling, 2001).

Based on these arguments about collaboration and innovation, Hypothesis 2a and 2b were formulated:

H2A: Firms engage in collaboration for innovation are more innovative

H2B: Firms engage in collaboration for innovation with HEIs are more innovative

4.4 Wine-producing regions and innovation

Previous studies show that regions differ in terms of specialisation, institutional endowments and culture (Fritsch and Schroeter, 2011; Hassink, 2005; Tödtling et al., 2011; Uyarra, 2009). Thus, regions develop and evolve differently (Cooke et al., 2004). In the context of the wine

industry, it has been shown that each *terroir* possess its own characteristics, dynamics and path of development (Cusmano, 2010, Muelle and Summer, 2006). Given that each *terroir* is unique, innovation may also vary considerably between and across different wine-producing regions. In the context of the Canadian wine industry, we can anticipate that innovation will differ among the regions because the wine-producing regions are different in terms of their physical conditions and institutional endowments (see chapter 5). Therefore, we expect that innovation is context-specific and that each region will display a unique path in terms of the innovation process.

Based on these arguments about the location of firms and innovation, Hypothesis 3 was formulated:

H3:Innovation will differ greatly among the Canadian wine-producing regions.

5 METHODOLOGY

5.1 Introduction

The methodology for this thesis is based on a research project developed by Professor Doloreux with the assistance of Evelyne Lord-Tarte[10]. Details provided in sections 5.2 and 5.3 come from articles that are either accepted for publication (Doloreux and Lord-Tarte, 2012a, 2012b) or under revision (Doloreux and Lord-Tarte, 2012c).

This chapterfirst presents the sample of the data, followed by the description ofthe data collection, and then the presentation of the variables and the data analyses. Finally, the statistical limitations of the methodology are stressed.

5.2 Sampling

5.2.1 The multi-step sampling method

The sampling was carried out using a multi-step method. The first phase of the sampling identified the universe of the unit of analysis of this research project: the wine firms operating in Canada. To develop a complete list of Canadian wineries, we considered eight sources in total; the first is the official establishments classified as wineries by Industry Canada under the code NAICS 31213. This listing regroups establishments primarily engaged in manufacturing wine, from grapes or other fruits. According to the official statistics in Canada (Industry Canada, 2010), the wine industry comprises establishments that are engaged in growing grapes and manufacturing wines and excludes those firms formally

[10]With regards to the specific contribution of the author, she was involved in the research project since its very beginning. More precisely, she participated to the identification of the population, to the identification of the key empirical findings on innovation of the wine industry, to the design of the survey, to the analyses and to the redaction of the articles. These steps are used or partly used in this thesis.

belonging to adjacent sectors. These include sectors such as winemaking component and products and alcoholic beverage wholesales-distributors. We also included wineries listed under the following Canadian wine industry sources: Canadian Vintners Association (CVA) (www.canadianvintners.com), Canadian Wineries (www.canwine.com), and the Wine Atlas of Canada. Finally we included wineries enumerated from these provincial sources: VQA Member Wineries (www.vqaontario.com), Wine BC (www.bcwine.com), the wineries of BritishColumbia, British Columbia and Ontario Wine Country, and *Les vins du Québec*. For the purpose of this study, we excluded all establishments producing alcohol other than wine. For instance, firms producing brandy or fruit alcohol were excluded from our listing.

Based on these sources and criteria, a total of 317 establishments were identified. For all these wineries, the following information was collected: mailing address, phone number, contact name (owner or manager), web site address, and email address. This information was then forwarded to a survey firm, which reached and interviewed a total of 146 Canadian wineries (see Table 3).

Table 3 Survey responses

	Population	**No. Responses**	**% Response**
TOTAL	*317*	*146*	*46.1*

Source: Canadian Wine Survey, 2009

5.2.2 Wine-producing regions

We define a wine-producing region as adelimited area characterised by a collection of vineyards. As other studies on innovation have suggested (McDermott, 2007; Taplin, 2010), the geographical scale of a wine-producing region taken by this thesis refers to a province.Indeed, we investigate innovation dynamics in the 3 main Canadian wine-producing provinces of: British Columbia, Ontario and Quebec.

By considering a region in administrative terms, it enables to us to capture and compare the government policies and actions taken to support the development of the wine industry.As further elaborated in Chapter 6, the Canadian wine industry has an institutional framework

functioning in silos, and is provincially governed. More precisely, Canadian wine provinces have their respective support infrastructure, legislations and market.

With respect to the support infrastructure, most organisationsare designed specifically to fit their provincial needs (Chapter 6). For instance, the appellation of origin Vintner Quality Alliance (VQA) of Ontario and British Columbia are two separate entities, working in silos on the mandate to set the regulations and standards for the wine production of their respective province.Regarding the laws and regulations, the Canadian Constitution states that the sale and distributionof alcoholic beverages are the sole responsibility of the ten provinces (Department of Justice Canada, 2012).Furthermore, the wine sales are concentrated at the provincial level for two main reasons. First, limiting the sale of wine outside their province, the Importation of Intoxicating Liquors Act (IILA) prohibits the transportation of alcohol beveragesacross the Canadian provinces[11]. Second, the sales strategy is relatively similar through provinces, given that provincial state-owned corporations administer the sale and distribution of alcoholic beverages.

From our samplerepresenting a total of 146 Canadian wineries, 57 are located in Ontario, 49 in British Columbia and 40 in Quebec (see Table 4).

Table 4 Survey responses by region

	Population	**% of the population**	**No. Responses**	**% of the sample**	**% Response**
Ontario	108	34	57	39	52.8
British Columbia	158	50	49	34	31.0
Quebec	51	16	40	27	78.4
TOTAL	*317*	*100*	*146*	*100*	*46.1*

Source: Canadian Wine Survey, 2009

However, one could argue that the notion of *terroir*refers to a smaller geographical scale than

[11]One should note that federal Bill C-311 was effective on June 28, 2012. This amendment removes the federal restrictions prohibiting individuals from moving wine from one province to another when purchased for personal use (Parliament of Canada, 2012). However, this law was not in effective at the moment firms were surveyed.

provinces. Indeed, a smaller geographical scale would enable us to capture the very specific natural and physical conditions, such as microclimates, which may not be found elsewhere within the province. To make an international comparison, the French viticulture areas following the appellation of origin (e.g. Bordeaux) are dissimilar fromtheir administrative regions(e.g. Aquitaine). In the case of Canada, to capture the very specific natural conditions, wemay refer to the VQA official viticulture areas. The VQA official viticulture areas of Ontario are: Niagara Peninsula, Lake Erie North Shore, Peele Island, and Prince Edward County, and the BC VQA official viticulture areas of British Columbia are: Okanagan Valley, Similkameen Valley, Vancouver Island, Gulf Island, and Fraser Valley[12]. From these, the two viticulture areas with the most prominence include the Okanagan Valley, from British Columbia and the Niagara Peninsula, from Ontario. Indeed, these are the main viticulture areas of their province given the number of wineries and volume of production. Therefore, one could argue that the innovation dynamics of the Okanagan Valley and the Niagara Peninsula would differ from other Canadian wineries because of specific natural and physical conditions as well as their more developed stage of development.

However, when comparing innovation, the provinces are the preferred geographical scale over the viticulture areasfor three main reasons.First, when comparing the Okanagan Valley and the Niagara Peninsula, it would involve aggregating all other regions into a single category. Thus, this latter category would content firms from different provinces. This would therefore generalise the reality of firms with very different institutional frameworks.

Second, there are methodological issues associated with the viticulture areas, given the very low response rate. Indeed, given the total population of 317 establishments identified, 71 are located in Niagara, and 97 in Okanagan. Our survey includes 26 wineries from Niagara and 31 from Okanagan. This represents a response rate of respectively 36.6% and 31.9% (see

[12]However, the Quebec wine firms are spread out through the province, and there is an absence of official viticulture area.

Table 5). Thus, viticulture areas have a relatively low representation in the sample andan inadequate number of observations. Since regional comparisons require a substantial number of observations to provide robust statistical analyses, provinces are preferred over viticulture areas because they provide better representation is the sample.

Third, with respect to results on innovation dynamics, the classification of a wine-producing region based on a viticulture area does not provide any valuable insight. In order to verify whether a classification based on viticulture area is preferable to one basedon provinces; we tested the innovation dynamics along with firms from Okanagan Valley, Niagara and from rest of Canada. The results are presented in Appendix B. It shows an absence of statistically significant results with respect to a firm's innovation activities, sources of knowledge for innovation, types of innovation developed and barriers to innovation. Therefore, the preferred classification of wine-producing regions is based on provinces.

Table 5 Survey responses by Okanagan Valley, Niagara Peninsula and the rest of Canada

	Population	**% of the population**	**No. Responses**	**% of the sample**	**% Response**
Niagara	71	22	26	18	36.6
Okanagan	97	31	31	21	31.9
Others	149	47	89	61	59.7
TOTAL	*317*	*100*	*146*	*100*	*46.1*

Source: Canadian Wine Survey, 2009

5.2.3 Sample limitations

Three considerations must be stressed regarding the sample. The firstrefers to the small sample of firms studied. The relatively small sample size is essentially due to the fact that the target universe of the Canadian wine industry is in itself very small. In small population research, it would be ideal to include the entire population of interest. We were unable to interview all the firms: only 146 out of 321 firms participated to our survey. Given that some of our analyses divided the sample into subgroups, some statistical analyses are performed on relatively small number of firms. This may reduce the robustness of statistical results.

Additionally, it might be difficult to make statistical generalisation from our results given this depends on the size and internal variation within the population and sample (Yin, 1984).

Second, the sample might be subject to statistical bias regarding the provinces representation. On one hand, firms from Ontario and Quebec are slightly over represented in the sample given they account for 39% and 27% respectively, but represent 34% and 16% of the total Canadian winery population. On the other hand, firms from British Columbia are somewhat underrepresented at 34% of the sample but representing 50% of the population (see Table 4). Consequently, results might represent to a higher extent reality of Ontario and Quebec and to a lesser extent British Columbia.

The third refers to the aggregation of different viticulture areas into provinces. Consequently, the results generalise the reality of firms from more developed viticulture areas (Okanagan and Niagara) with firms from emerging viticulture areas (such as Gulf Island and Prince Edward County). In addition, this aggregation may not capture the very specific natural conditions inherent to each viticulture area. However, as presented previously in this Chapter, we consider province as the preferred geographical scale for wine-producing region.

5.3 Data collection

In order to investigate the salient development features of the Canadian wine industry, two types of secondary sources were examined. The first was through Agriculture and Agri-Food Canada (2010) and different official winery directories[13]. Within this secondary data collection, particular attention has been given to the development and to the identification of the institutional actors within the Canadian wine industry.

[13]This include public sources such as Canadian Vintners Association (CVA) (www.canadianvintners.com), VQA Member Wineries (www.vqaontario.com), Wine BC (www.bcwine.com), Canadian Wineries (www.canwine.com), the Wine Atlas of Canada, the wineries of British-Columbia, British Columbia and Ontario Wine Country, and *Les vins du Québec*.

For the second data collection strategy, a firm-level survey was conducted given that there is no official quantitative data available on the innovation activities in the Canadian wine industry. Drawing on the *Oslo Manual* (OECD, 2007), Community Innovative Survey (CIS) and Statistics Canada survey on innovation, as well as from the literature on the wine industry, a survey was designed to identify the mechanisms that stimulate learning and innovation (see Appendix A). The information in the survey is divided into seven sections. In the first section, firm's business strategies and competitiveness are investigated. In order to do so, firms are inquired on their geographical distribution of sales, and location of the most important customers and competitors. In the second section, the innovation activities undertaken and innovation outputs are questioned. This includes questions on various innovation activities as well as questions related to the types of innovation launched and their level of novelty (i.e. is the innovation new to the firms, to Canada, to the world). The third section examines the firm's collaboration strategy referring to the firm's source of information and channel of knowledge transfer. In order to capture this information, the questionnaire inquires firms on the relative importance and geographical location of their sources of knowledge and on cooperation partners. In the fourth section, R&D activities undertaken are examined. The fifth section inquires firms about the barriers related to innovation activities and their relative importance. The sixth section investigates the production strategies of firms such as the source of knowledge for production techniques. Finally, the seventh section intends to collect demographic data of the firms participating. In order to do so, the characteristics of the establishments were surveyed in terms of ownership characteristics, number of employees, age of the business, level of workforce skills and governance.

The survey was carried out between April and December 2010, through Computer-Assisted Telephone Interviewing (CATI). Data was gathered from 146 Canadian wineries, which represent a response rate to the survey of 46.0 per cent (Table 3). Afterward, the statistical data analysing process was executed through computer programs used for statistical analysis: Excel and SPSS.

5.4 Variables and analytical approach

This section describes the variables and analytical approach undertaken to fulfil the second and third research questions of this thesis[14]. In order to harmonise the findings, the indicators used within this thesis are based on the Olso Manual (OECD, 2007).

5.4.1 Variables and analytical approach for innovation dynamics

The second research question investigates the innovation dynamics of the Canadian wine industry. Following the guidelines of the Olso Manual (OECD, 2007), innovation dynamics are defined as the domain most central to business innovation, which covers dynamic factors within or immediately external to the firm and very directly impinging on its innovativeness. Innovation dynamics are based on the following indicators: (1) innovation activities, (2)sources of information for innovation, (3) innovation development, and (4) obstacles to innovation.

5.4.1.1 Innovation activities

Innovation activities consist of expenses associated with innovation, which are considered as investments given that they contribute to raise the economic and innovative potential of the firm. Innovation activities include all scientific, technological, organisational and financial measures adopted to launch or aiming to implement innovations (OECD, 2007). The following are the innovation activities used in this thesis: (1)development of new products and processes (internal R&D), (2) external R&D, (3) acquisition of machinery, equipment and software, (4) acquisition of other external knowledge, (5) training, (6) activities undertaken to ensure the commercial success of new or significantly improved products.

[14]The first research question is voluntarily omitted in this section, given that the salient features of the Canadian wine industry are identified with secondary sources data rather than with firm-level data.

5.4.1.2 Sources of information for innovation

With regards to the Olso Manual (OECD, 2007:50), the objective towards the sources of information for innovation "should be to relate the technological assets and strategies of firms to the scope of their sources of information for innovation […] Most firms have a wide range of potential sources of technical information. Their importance will vary with the firm's technological capabilities and strategy". Following these guidelines, the following are the knowledge sources for innovation examined in this thesis:

Market sources:	(1) suppliers, (2) clients and customers, (3) competitors or other firms within the same sector, (4) business service companies;
Institutional sources:	(5) universities, (6) colleges/technical institutes, (7) federal government agencies, (8) provincial government agencies;
As other sources:	(9) industry associations, and (10) conferences, trade fairs, exhibitions.

5.4.1.3 Types of innovation development

According to the Oslo Manual (OECD 2005), innovation is the implementation of a new or significantly improved product (good or service), process, marketing method, or organisational method in business practice. Using the data item approach, the classification of the types of innovation develop is based on the Olso Manual (OECD, 2007) and is adapted to the wine industry. The following innovation types are investigated:

As product innovations:	(1) improved products;
As process innovations:	(2) growing techniques (mechanized viticulture, grape stocks, irrigation practices, etc.), (3) production techniques (control of winemaking practices, methods of grape and wine analysis, etc.);
As organisational innovations:	(4) managerial techniques (knowledge management practices), and (5) marketing strategies and concept

processes (labels, brand; product positioning and profiling, etc.).

5.4.1.4 Innovation barriers

The survey attempts to capture the relative importance attributed to various innovation barriers. The following are the innovation barriers investigated:

Economical: (1) lack of funds within the establishment for innovation, (2) lack of finance from sources outside the establishment for innovation, (3) high innovation costs;

Enterprise: (4) lack of qualified personnel to work on innovation projects, (5) lack of information on technology, (6) difficulty of identifying cooperation partners for innovation, (7) inability to devote staff to innovation projects on an on-going basis because of production requirements, (8) risks related to the feasibility of the innovation project;

Juridical: (9) Governmental regulations.

5.4.1.5 Statistical data analyses for innovation dynamics

With regards to the analysis of the innovation dynamics, descriptive and non-parametric tests are used. A Chi-square Test is conducted to compare and examine whether there are significant differences among different groups of firms.

5.4.2 Variables and analytical approach for collaborations

The third research question aims to investigate collaborations, their spatial arrangement, and the types of partnerswith a particular emphasis on HEIs. To fulfil the third research questions, the following indicators and statistical approach are presented in this section: (1) characteristics of collaborators and HEIs collaborators (2) innovation dynamics of

collaborators and HEIs collaborators (3) occurrence of collaboration, (4) spatial distribution of collaboration and, (5) motivations to collaborate with HEIs.

5.4.2.1 Characteristics of collaborators

In order to draw the demographic profile of collaborators and HEIs collaborators, the following characteristics are explored: age (mean value in 2009), size (mean of total employment), and province location (British Columbia, Ontario or Quebec). Dimensions specific to the wine industry included: employment of oenologists and/or agronomist (yes or no), and production of *vinifera* grape varieties (yes or no). The employment of oenologists and/or agronomist refers to skilled workers specialised in the wine industry, which leverages the firm's knowledge base. Wine firms growing *vinifera* grape varieties are located in Brisith Columbia and Ontario, while wine firms growing *labrusca* and hybrid grape varieties are located in Quebec. Non-parametric statistical methods are used (Chi-square Tests) to examine the significance of variation between collaborators/non-collaborators and HEIs collaborators/non HEIs collaborators.

5.4.2.2 Innovation dynamics of collaborators

The variables used for innovation dynamics are the same as previously presented[15]. To them is added the level of innovation development intensity. The number of innovations types developed by the enterprise within the last three years determines this variable. Four levels of innovation intensity are used: (1) the enterprises which have not developed any innovations during the last three years; (2) enterprises which have developed one or two innovation types; (3) enterprises which have developed three or four innovation types; and (4) enterprises that have developed more than four innovation types. Non-parametric statistical

[15]The innovation dynamics dimensions used are the same as previously presented in sections 4.4.1.1, 4.4.1.2, 4.4.1.3 and 4.4.1.4 namely: (1) innovation activities, (2) knowledge sources, (3) innovation development, and (4) obstacles to innovation

methods were used (Chi-square Tests) to examine the significance of variation between collaborators/non-collaborators and HEIs collaborators/HEIs non-collaborators.

5.4.2.3 Occurrence of collaboration

This analysis investigates the types of partners used most frequently for innovation related activities[16]. If firms positively answered to collaborate, they were asked whether they collaborate or not with the following actors: (1) clients or customers, (2) suppliers of equipment, material, components, or software, (3) competitors or other firms in your sector, (4) business service firms/consultants, (5) universities, (6) colleges/technical institutes, (7) laboratories research institutes, (8) industrial associations. This question simultaneously asked firms on the location of the partner, thus the result is a matrix of types of collaborators by their localisation.

To examine the frequency of the types of partners, these are aggregated into three different categories:[17]

1. Clients or customers;
2. Firms: suppliers, competitors, and service firms;
3. Public institutions: universities, colleges, and research institutes and industry associations.

5.4.2.4 Spatial distribution of collaboration

Concerning the spatial distribution of collaboration, data was gathered through the same question used to identify the type of partner, which simultaneously asked firms on the types and location of their partners for innovation[18]. The analysis is based on three different spatial scales, namely: regional, national, and international. Accordingly, we identify as 'regional' the co-operative arrangements with partners which are located within a 100km distance from

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[16]The nature of this analysis limits its application to the third research question.
[17] Actors are aggregated into categories to overcome the small proportion of collaborations tied.
[18]The nature of this analysis limits its application to the third research question.

the establishment; as 'national' the co-operative arrangements with partners located elsewhere in Canada; and, as 'Foreign new wine countries' the co-operative arrangements with partners in US, South America, Australasia and South Africa; and 'Foreign traditional wine countries' the co-operative arrangement with partners in Europe (France, Italy and Spain).

5.4.2.5 Motivations to collaborate with HEIs

The analysis on the motivations for firms to collaborate with HEIs[19] investigates the relative importance attributed to motivations. These can be regrouped into three categories:

Employment of students:	(1) work placement, (2) recruitment of post-graduates;
Product development:	(3) joint R&D project with academic centres, (4) sharing facilities, (5) contracting out research and advice;
Continuous learning:	(6) continuing education for employees, and (7) sharing employees with academic centers.

Descriptive statistics are used to depict the relative importance of these motivations.

5.5 Statistical considerations

There are three methodological considerations that must be acknowledged. First, being so specific, the context of the Canadian wine industry provides insights and challenges literature in some aspects rarely considered. These unique conditions include its very recent age, it's very distinctive development conditions, and it's specific grape growing conditions. In consequence it might be difficult to generalise results to other industries, as well as to wine industry is other geographical locations. As a common criticism of case studies, the results of this research project are dependent on a single case, making it difficult to reach a generalised conclusion (Eisenhardt, 1989).

[19]The nature of this analysis limits its application to the fourth research question.

The second consideration refers to the relatively small sample size, which has two repercussions. First, descriptive and non-parametric analyses are preferred over multivariate analyses. The purpose of the descriptive and non-parametric tests used in this studyis to investigate the association between the variables and examine whether there are significant differences between different groups of firms. This implies that these analyses neither attempt nor are sufficient to capture the causality effects between variables. Second, when the sample is divided into subgroups, these may content a very small number of observations. In consequence, this may reduce the robustness of statistical results. More specifically, it leverages the risk that two events would occur together by chance, when there is no underlying association between them. In other words, some statistically significant results might be mistaken in small data set.

The third consideration concerns our cross-sectional data; caution must the taken regarding the temporal boundaries (Yin, 1984). In fact, the findings reflect the reality of the firms' surveyed between April and December 2010. Thus, the data examination must acknowledge the context when these were collected (Yin, 1984). Moreover, given the agriculture natureof the wine industry, product innovations may take a considerable time todevelop. Indeed, according to McDermott (2007:110) "any new vine takes two to three years to yield testable results, and any quality and taste modification to grape growing takes eighteen to twenty-four months". Therefore, this research project may not be able to capture the effect of innovation activities recently initiated. To mitigate such limitations and to have a longitudinal evolution and development of the industry, it would be ideal to include multiple data collection at different points in time. However, time constraints forced the temporal boundaries of the data collection and the analysis of this study.With this caveat in mind, the legitimacy of the analyses should not be comprised.

6 CHARACTERISTIC AND DEVELOPMENT TRENDS IN THE CANADIAN WINE INDUSTRY

6.1 Introduction

Results presented in this chapter are part of an article accepted for publication in The Social Science Journal (Doloreux and Lord-Tarte, 2012a). First, this chapter explores the salient features of the Canadian wine industry development and statistics. Second, it describes the key organisational actors in the Canadian wine industry. Third, it compares the development of wine industry in British Columbia, Ontario, and Québec. The analysis focuses on the key organisational players and on the factors that have shaped its recent development.

6.2 Key Canadian wine industry statistics

As of 2008, the wine industry counted 321 mostly small-sized wineries. In the last decade, direct employment has grown steadily from 1,308 employees in 1998 to 2,962 in 2008 (Table 6). About 73.8% of the wineries employ less than 10 employees, with 16.8% having between 10 and 49 employees, and 10.1% having more than 50 employees (Agriculture and Agri-Food Canada, 2010). Most jobs and wineries are concentrated in Ontario and British Columbia, in particular in Niagara and Kelowna.

In terms of the agricultural area dedicated to wine-producing grapes, Canada counted 11,800 hectares in 2006, an increase of nearly 33% from 1998 (Statistiques viticoles mondiales, 2006). This viticulture area is comparable to Switzerland's (14,900 hectares), but it is much smaller than the viticulture areas found elsewhere in North America (396,700 hectares in USA), South-America or Europe. Suiting the local climate, Canada has specialised in the *vinifera* grape varieties such as Riesling, Chardonnay, Pinot noir, Merlot, Cabernet Sauvignon, and Cabernet Franc. Production revenues have more than doubled between 1998 and 2007, while the volume of production has increased by 25%. However, despite the rapid increase that occurred in the last ten years, Canada remains a marginal player in the global wine market.

The Canadian wine production is mainly sold domestically. The export production as a percentage of domestic production stood at 2.6% in 1998, it then peaked at 14.8% in 2001 and fell back to 3.0% in 2007 (Agriculture and Agri-Food Canada, 2010).

Table 6Key Canadian wine industry statistics, 1998 - 2007[20]

Principal statistics	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Establishments[a]	230	239	246	238	245	250	254	254	320	321
Employment total[a]	1,308	1,437	1,836	2,471	2,933	3,075	2,828	2,389	2,766	2,962
Producing areas (1000 hectares)[b]	7.8	n.d.	n.d	10.6	n.d	n.d	10.6	10.6	11.8	n.d.
Production values (millions $)[a]	409.2	n.d	650.4	650.4	701.4	780.7	801.1	780.1	789.6	820.9
Production (1000 hl)[b]	403	n.d.	n.d	460	n.d	n.d	522	504	504	505
Exports values (millions $)[a]	11	37	74	97	103	62	41	49	35	25
Exports % of production[a]	2.6	7.4	11.2	14.8	14.8	8.1	5.1	6.3	4.5	3.0

Source: [a]Agriculture and Agri-Food Canada, 2010; [b] OIV, 2007.

6.3 The support infrastructure

The wine industry development is supported by multiple organisations that provide information and training for thepool of skilled workers (Table 7). The three most important higher education institutions dedicated to wine research are the Brock University's Cool Climate Oenology and Viticulture Institute (CCOVI), the University of British Columbia's Wine Research centre (UBCWRC), and the University of Guelph. There are also three technical colleges: the Niagara College, the Okanagan University College (OUC), and the Nova Scotia Agricultural College. The CCOVI research priorities are to develop cool climate viticulture, oenology, and the wine business in Canada. It also offers continuing education and outreach services. Similarly, the UBCWRC promotes technological advancement in the wine industry by carrying out research in oenology and viticulture. The University of Guelph conducts viticulture experimental programs. Three colleges complete the education and training system: the Niagara College provides winery and viticulture technical programs in

[20]As of April 2012, the most recent statistics available from Agriculture and Agri-Food Canada and OIV are from 2007.

three specialty areas: winemaking, viticulture, and sales/marketing; the Okanagan University College offers three certificates in winery operations, wine sales, and viticulture; and the Nova Scotia Agricultural College offers a bachelor diploma in collaboration with Brock University in viticulture and oenology.[21]

In addition, there are two research centres: one is the Pacific Agri-Food Research Centre in British-Columbia, which is one of Agriculture and Agri-Food Canada's national network of 19 research centres, and the one other is the Vineland Research and Innovation Centre of Ontario. Furthermore, there are different business and industrial associations whose main purposes are to represent, promote, and support the interests of the industry, as well as to provide information and advice to its members on government policies, programs, and legislation.

Finally, there are two regulatory agencies responsible for maintaining the integrity of local wine appellations and for maintaining winemaking and labelling standards. The regulatory and appellation systems guarantee the quality and authenticity of origin for Canadian wines made under that system in British Columbia (VQA British Columbia) and Ontario (VQA Ontario).

[21] Local students will be trained years 1 and 2 at the Nova Scotia Agricultural College and then will completed their bachelor degree (years 3 and 4) at Brock University.

Table 7 Support organisations in the Canadian wine industry

Education and training	- Brock University Cool Climate Oenology and Viticulture Institute - University of British Columbia (Wine Research Centre) - Niagara College - Okanagan University
Research Centers	- Pacific Agri-Food research Centre - Vineland Research and Innovation Centre
Industrial association	- Canadian Vintners Associations - Grape Grower of Ontario - Ontario Viticulture Association - BC Grapegrower Association - Association of British Columbia Winegrowers - Winery Association of Nova Scotia - Association des vignerons du Québec - Vignerons Independant du Quebec - 10 other local vintners associations
Other support organisation	- Wine Council of Ontario - British Columbia Wine Institute - BC Wine Grape Council
Regulatory agencies	- Vintners Quality Alliance Ontario - Vintners Quality Alliance British Columbia

6.4 Regional structure of the wine industry in Canada: three cases studies

This section details and compares the development of wine industry in Ontario, British Columbia, and Quebec. The following analysis focuses on the key organisational players and on the factors that have shaped the recent development of the wine industry in these regions.

6.4.1 Ontario

Ontario is Canada's largest wine growing region and, by Canadian standards, is a relatively well-established wine region. According to the VQA Ontario appellation of origin, Ontario has four official viticulture areas: Niagara Peninsula, Lake Erie North Shore, Peele Island, and Prince Edward County. Many grape varieties are produced in these regions. The most prominent red varieties are Cabernet Franc, Merlot, Pinot Noir, Gamay Noir, and Cabernet Sauvignon; with Riesling and Chardonnay for the white varieties.

The Ontario wine industry is composed of 147 wineries, which are small and medium-sized (less than 50 employees). The number of wineries has increased from 48 in 1998 to 102 in 2005. In 2009, wineries employed approximately directly and indirectly 2,602 people and

sold about 13 million litres, for a total production of C$575 million. With a total of C$11.9 million of sales outside Canada, export markets have developed for a range of varieties, especially for ice wines and late-harvest dessert wines. Vincor Canada (which is a division of Constellation Brands) and numerous small and medium-sized enterprises have made efforts and have had some success accessing foreign markets, but the Ontario wine market is still predominantly domestic.

Table 8 Main figures of the Ontario wine industry, 2008[22]

Number of viticultural areas [a]	4
Total vine area (ha)[b]	6000
Number of establishments[c]	147
Total number of employees[b]	2 602
Number of public organisations	12
Total production (millions of liters)[a]	13,0
Value of production (millions $)[b]	575,0
Value of export (millions $)[d]	11,9

Sources: [a] Annual report VQA de 2009, [b] Ontario Wine Council, [c] Canadian Business Patterns (2009) [d] Industry Canada 2009.

The history of the development of the wine industry in Ontario was strongly affected by two main elements. First is the license given by the Liquor Control Board of Ontario in the 70s to Inniskillin Wines to produce and sell wine. This is the factor that opened the wine industry of the province and that initiated substantial structural changes. The second factor is the inauguration of the Canada/USA Free Trade Agreement (FTA) in 1988. Before it was signed, the government of Ontario guaranteed to grape growers that their crops would be sold to wineries at negotiated prices and producers were assured that their grape crops would be sold at vineyard prices. In addition, grapes rejected by winemakers were purchased by the government and used to produce industrial alcohol. With the FTA, measures and tariffs on imported wines and national wine protections ceased. The signing of this agreement led to the listing and distribution of wine through the Liquor Control Board of Ontario (LCBO), to

[22] Up to April 2012, the most recent statistics available from Ontario Wine Council andIndustry Canada are from 2008

the progressive equalisation in the mark-up on imported and domestic wine, and to the elimination of import duties on wines. Under the new agreement, foreign wines would enter the Canadian domestic market under the same conditions as Canadian wines, thereby pressuring local wine producers to increase their quality while maintaining competitive prices.

Following the FTA, development of the industry continued with the creation of the Vintners Quality Alliances (VQA) in 1988. VQA Ontario is the provincial wine authority managed by the Ministry of Consumer and Business Services of Ontario, which is legally responsible for the industry's administration and regulations. The VQA Ontario sets "the framework by which standards for the production of VQA Ontario wine and appellations for wine growing regions are established" (VQA, 2010). The VQA has strongly affected the development and the operations of the industry not only by promoting quality and label integrity, but also by promoting the recognition of Ontario's wine appellation and its unique characteristics. Since the adoption of the VQA Act in 1999, the certification standards of the VQA have become mandatory for all Ontario wine production.

As the industry evolved in the early 90s, the number of wineries increased and a public research infrastructure developed in parallel to support and encourage the growth of the industry. This infrastructure includes The Wine Council of Ontario (WCO), a non-profit trade association that currently represents 72 wineries in Ontario. The WCO acts as a catalyst for the development of a more cohesive industry in Ontario by promoting the industry to the public and by representing the interests of its members. There is also the Cool Climate Oenology and Viticulture Institute (CCOVI) at Brock University, which was created in partnership with the Grape Growers of Ontario and the Wine Council of Ontario in 1996. The institute focuses on the research priorities of the Canadian grape and wine industry and on the needs for continuing education and outreach services. Finally, there is the Vineland Research and Innovation Centre, which provides research expertise in different areas of horticulture as well as research programs in line with the needs of the industry.

Development of the industry continued with the Ontario's Wine Strategy initiated by the provincial government in 2009. The purpose of this initiative is to foster growth as well as the long-term sustainability of the VQA wines. The organisation directs its activities towards the support of VQA wine related to marketing, tourism as well as the grape growing sector. Since 2006, it has provided more than C$13 million to 63 wineries, resulting in a 17.0% sales increase in 2009, compared with 2006, when financing started.

In the case of Ontario, the favourable background for the birth and development of a wine region has been stimulated by the role of government that has adopted top-down strategies to raise the industry's competitiveness. These measures include quality standards (VQA), and the relaxation of sales and distribution regulations to allow on-site sales in designated stores outside the winery and sales directly to restaurants. In addition, the institutional configuration also contributed to the industry's development. A number of regional associations have been created to coordinate activities and contribute to regional empowerment. We must also mention the presence of higher education institutes adapted and meeting the needs of the wine-growing conditions of Ontario. This is, specificallythe Brock University's Cool Climate Oenology and Viticulture Institute (CCOVI), located in the main viticulture area of Ontario: Niagara-on-the-Lake. Moreover, a few wineries (e.g. Inniskillin, Andrew Peller) have reached a considerable size and thus foster development as they set quality standards, improve the notoriety of the region, and attract new wineries to the area.

6.4.2 British Columbia

In 2009, the British Columbia wine industry was composed of 174 wineries and employed about 2000 people. The number of wineries has increased significantly over the last 20 years, from 17 in 1990 to 174 in 2008. The wine industry employs directly and indirectly 2000 persons. About 65.0% of the wineries are small, employing less than 10 persons.

British Columbia has five viticulture areas according to the BC VQA appellation of origin: Okanagan Valley, Similkameen Valley, Vancouver Island, Gulf Island, and Fraser Valley (See Table 9). Historically, most of the wine production has taken place in the Okanagan

Valley, which is still the province's largest wine growing region with about 84.3% of the grape acreage. Wine production has recently expanded to sub-regions such as Gulf Island and Fraser Valley. Wineries in British Columbia grow *vinifera grape* varieties in red (Merlot, Pinot Noir, Cabernet Sauvignon, Cabernet Franc) as well as white varieties (Pinot Gris, Chardonnay, Gewurztraminer, Sauvignon Blanc).

The wine industry in British Columbia has been expanding steadily and rapidly in the past decades. Between 1994 and 2008, the grape-growing area has quadrupled, from 0,859 ha to 3,626 ha, and the regional harvest has increased by the same magnitude from under 6 tons in 1996 to over 22 tons in 2008. The total production of wine was 15.0 million litres in 2008, an increase of over 400% compared to the 4.8 million produced in 1994. Most of the production goes in the domestic market, with less than 4% of the total production exported to foreign markets.

Table 9 Main figures of the British Columbia wine industry, 2008

Number of viticultural areas	5
Total vine area (ha)[a]	3,626
Number of establishments[a]	174
Total number of employees[b]	2000
Number of public organisations	14
Total production (millions of liters) [a]	15.0
Value of production (millions $)[a]	160
Value of export (millions $)[b]	6,7

Sources: [a] BC Wine Institute, Annual report 2009; [b] Industry Canada, 2009

The development of the industry began in the late 80s. A landmarkin this development was reached when Harry McWatters, the founder of Sumac Ridge Estate, convinced the Liquor Control and Licensing Branch (LCLB) to issue him a license to produce and sell wine. Another landmark is the Becker Project, an experimental program led by Dr Becker from the Geisenheim Institute in Germany that ran from 1975 to 1985, and which demonstrated the potential for the growth of *vinifera* grapes varieties, which are known to make better quality wines in the region. Prior to that, plant varieties were *labrusca* or hybrid; and the quality of the wine was poor and mainly sold to the government.

However, after the adoption of the FTA in 1988, the provincial government could no longer prioritise local wine over foreign products. Thus, in order to support the development of the wine industry, the government attempted to improve wine quality by offering subsidies to growers and by removing the restrictions on importing *vinifera vines* from France. This strategy included incentives to replace *labrusca* and hybrid grape varieties with *vinifera* varietals. This encouraged the establishment of new a generation of wineries producing a better quality of wine. This initiative was an important milestone, which helped the industry develop and grow.

This initiative was followed by the development of the British Columbia VQA in 1990. The British Columbia VQA standards have been set by the BCWI and the two bodies remain strongly linked. However, since 2007, the BC Wine Authority (BCWA) is responsible for viticulture practices and standards. The British Columbia VQA has the same objective as the Ontario VQA, namely, to guaranty the authenticity of origin and to set quality standards for British Columbia wines. However, members join the organisation on a voluntary basis, as opposed to the compulsory membership imposed by the Ontario VQA system.

Still in 2007, the BCWI, a service organisation serving the wineries and grape growers of British Columbia, was created. The BCWI provides an umbrella for the industry by offering it different services to support its development, such as marketing, R&D, and liaisons activities with other stakeholders and with the government. It also promotes and secures quality through the British Columbia VQA program. In 2010, it had 100 members and 15 grape-grower partners representing 95% of the province's total wine production and sales.

As the industry developed in the last decade, new public organisations were created to support the industry: The University of British Columbia's Wine Research Centre, specialised in research in oenology, viticulture, training and human resources; the Okanagan University College, which offers technical courses related to the wine industry; the British Columbia Wine Grape Council, which provides support to members through training and education programs and the development of resources to encourage the implementation of

safety standards and guidelines; and the British Columbia Grape Growers Association, which represents grape producers' interests. One should note that these organisations are located in the largest viticulture area: Okanagan Valley.

In the case of British Columbia, the factors enabling the birth and development of a wine region are similar to those in Ontario. The government has been involved in the quality improvement and in the promotion of better wine quality ever since the signing of the FTA. In addition, this wine-producing region enjoys a well-developed education infrastructure (Wine Research Centre, located in the University of British Columbia,University of Kelowna). Compared with Ontario, the initial support from the British Columbia government was more centralised, including governmental programs to encourage the growth of better grape varieties, to control sales and distribution (BC Liquor Store, VQA stores), to establish the wine quality standards (BC VQA), to conduct research and development (Pacific Agri Food Research Centre), and to support promotion of wine products (BCWI).

6.4.3 Quebec

The wine industry in the province of Quebec is composed of 56 wineries, which are small and mostly family-owned, with low levels of production, which rely on domestic wine tourists. The number of wineries has increased from 28 in 1990 to 49 in 2000. Total wine production was only 0.35 million litres in 2009 and the size of the viticulture area was 278.2 hectares in 2010, which represents only 2,5% of the Canadian total viticulture area (See Table 10). Wine production mostly takes place in the Eastern Townships, Montérégie, and Quebec regions (75%), but also sparsely in the regions of Basses Laurentides, Centre-du-Quebec, Lanaudière, Bas-Saint-Laurent, and Outaouais. In terms of grape varieties, *labrusca* (Sainte-Croix, Vandal-Cliche, Vidal Maréchal Foch and Seyval Blanc) and hybrid grapes are the main varietals growing in Quebec.

Compared to Ontario and British Columbia, the wine industry in Quebec is clearly at an earlier stage of development. Its development dates back to the 80s when the first wine producers started planting varieties known to resist cold and harsh climates. The

development was affected by the creation of licenses to operate vineyards. Prior to that, the development of vineyards was impeded by the sales restrictions imposed by the Société des Alcools du Quebec (SAQ), a government-owned corporation responsible for the trade of alcoholic beverages within the province of Quebec. In 1985, the Government of Quebec began issuing permits enabling wineries to sell their production. However, this license was only awarded to farms possessing more than 5,000 vines.

Development of the industry was reinforced with the creation of the Quebec Winegrowers Association (QWA). The QWA was founded in 1987 to help wine producers counter the barriers related to governmental sales production and to offer different support services related to grape production, winemaking, and marketing. This association coordinates the development of Quebec's wine industry. One of its objectives is to develop a certification of origin similar to the VQA's appellation, but which is yet to be completed. In 1995, the QWA established a professional partnership with the *Syndicat Viticole des Graveset Graves Supérieurs* of France, a wine designation of Bordeaux. This partnership was established to increase product visibility in the provincial, national, and international markets. In 1997, the association initiated several activities in the gastronomic, journalistic, political, artistic, and viticulture fields in order to promote Quebec's wines. The association also publishes a brochure entitled *Prenez la route des vins du Quebec* to provide information to visitors and clients about the activities and products of winemakers.

Another key step in the development of the wine industry occurred in 1996 when it became possible for restaurant owners to buy directly from winegrowers in Quebec. In the same year, the wines started to be sold at the SAQ and in specific food markets, such as the Marché Jean-Talon in Montreal.

The initial development of the Quebec wine industry is attributed to a small number of independent and often family-owned producers. On the other hand, government actions effectively responding to specific problems never allowed the emergence of the industry. The government never seriously addressed the need to develop and support the wine industry

with a strategic vision or to plan a set of coordinated actions. The support infrastructure is not developed and has a limited impact on the development of the industry.

Nevertheless, the sustained interest of producers in the wine industry and the desire to adopt a more 'active' approach in recent years from the winemakers led the creation of the *Vigneron Independent du Quebec* (VIQ). The VIQ was founded in 2006, with the objective of breaking the isolation of wineries and to allow them to share practices and to share knowledge related to growing techniques and wine production.

Table 10 Main figures of the Quebec wine industry, 2008

Number of viticultural areas[a]	8
Total vine area (ha)[a]	278,2
Number of establishments [a]	56
Total number of employees	n/a
Number of public organisations	1
Total production (millions of liters) [b]	0,35
Value of production (millions $)	n/a
Value of export (millions $)	n/a

Sources: [a] Association des Vignerons du Quebec, [b] Volume of sales, SAQ Annual Report 2009

Despite these initiatives, the harsh conditions for growing grapes are a key problem related to the development of the industry and a significant barrier to growth. In addition, the lack of coordination within the industry hampers grape growing and production; wineries explore in isolation different grape varieties and techniques. There is a large variety of grapes grown in Quebec, with 54 listed varieties (*Association des Vignerons du Quebec*, 2011), and the lack of coordination results in limited knowledge being shared between wineries on the production techniques.

The absence of a regulatory appellation system like those of Ontario and British Columbia as well as the limited distribution of wine are other key obstacles that undoubtedly slow the development and the growth of the industry in Quebec. Wine products in Quebec are sold mainly through the SAQ and its different outlets (*Classique Terroirs d'ici* outlet at the Atwater Market and four *Terroirs d'ici* agencies). Regional products are also sold at the *Marché des Saveurs* at the *Jean-Talon Marché*, a farmer's market in Montreal. The

distribution is hampered by the uncompetitive price of Quebec's wines. Given the harsh conditions and low production volume, the price of a bottle of wine in Quebec is often as high as the price of an imported wine of equal or superior quality.

The wine industry in Quebec has faced several impediments and it has not been exposed to factors that have helped the development of the wine producing regions in Ontario and British Columbia. As opposed to these provinces, the FTA has not pushed the Quebec wine industry to grow further. Even though the Ontario and British Columbia wine industries were small, they had been targeted by the agreement. On the other hand, Quebec's wine industry was at such an embryonic stage of development that it was omitted. The strong provincial regulations and the absence of a knowledge support infrastructure are both impediments to the development of the industry.

6.5 Conclusion

This section identified several insights with regards to the salient features characterising the development of the Canadian wine industry. First, there are significant variations in the way the same industry developed and grew in different parts of the country. In other words, there is not a specific path that characterises the development trajectory of the wine industry in Canada.

In the case of Ontario, the industry comprises wine firms that are expanding rapidly with the help of a relatively well-developed support infrastructure. A changing regulatory framework has, in part, provoked its development and growth. The signature of a Free Trade Agreement led to substantial structural changes in the industry and this profoundly impacts the desire to increase the quality and the competitive posture of the wine industry in Ontario. In addition, the creation of the VQA gave strength, elevated quality standards and built a more positive image to Ontario wines. The role of the government in the process was important, especially in supporting the production of VQA wines.

In the case of British Columbia, the desire to establish an industry based on a premium wine production was a critical factor explaining the development and growth of the industry. The government had a key role in re-organising the industry. This was done by incentives to replace the *labrusca* and hybrid grape varieties with *vinifera* varieties. The role of the government also provided an important support for the production of VQA wines. Another key to the development of the industry was the development of networks and associations that provide support to the industry and improve the business climate and market development. It is interesting to note, however, that in the case of Quebec, such conditions of development are not strong. This of course, had an impact on the development and growth of the industry.

In the case of Quebec, the government has not created a favourable framework to enable the development and growth of the industry. To a large extent, the government's regulations on the sales of alcohol products had a negative impact on the wine production and distribution. In addition, the absence of a support infrastructure limits the industry in its access to knowledge of leading practices, and on practices related to their specific conditions. As a result, the industry is still at its stage of infancy, with an incomplete support infrastructure and a low level of productivity. In addition, the difficulty of the industry to grow is also related to the harsh conditions to produce wine. Therefore, even if the sector is the same, the development of the wine industry has developed considerably differently in Quebec compared to the other two Canadian wine producing regions. Therefore generalisation about the Canadian wine industry path of development is difficult to make.

7 EMPIRICAL FINDINGS

7.1 Innovation dynamics

7.1.1 Introduction

This section presents the empirical results on innovation dynamics within the Canadian wine industry. Innovation dynamics are studied along four dimensions: innovation activities, knowledge sources, types of innovation, and obstacles to innovation. The firm's characteristics included in the analysis are firms': size age, type of grape cultivated and location.

In order to conduct the analysis, firms have been classified into sub-groups for each characteristic investigated. With respect to firms' size, the sample is divided into three sub-groups: micro (less than 10 employees), small (10 to 20 employees) and medium[23] (more than 20 employees). The majority of the sample is composed of micro size firms (86 firms), and the proportion of small and medium firms is rather small (respectively 48 and 12 firms). This is similar to the general statistics of the industry, which indicate that Canadian wine firms are in mainly small in size (Industry Canada, 2010). The sample is also divided into three sub-groups related to the year they were established: 18 firms before 1990, 51 firms between 1990 to 2000 and 77 after 2000. This tells us that our sample is relatively young, as more than half of the firms were created within the last 10 years. It is important to note that the classification of firms based on grape varieties refers indirectly to firms' location. Firms located in Quebec cultivate *labrusca* and hybrid varieties (regrouping 40 firms) while British Columbia and Ontario cultivate *vinifera* varieties (regrouping 106 firms). Thus, the majority of the sample produces wine out of grape varieties considered as noble (*vinifera*). The

[23]The term *large* is not an appropriated sub-group qualification, given that the largest firm of our sample employ 48 employees.

examination of the sub-groups based on the firm's location shows an even distribution among provinces: 49 firms are located in British Columbia, 57 in Ontario and 40 in Quebec.

7.1.2 Innovation activities

In order to survey firms on their innovation activities, the questionnaire we created asked the following question: "During the last three years, 2006 to 2009, did your establishment engage in the following innovation activities?" Firms were asked to answer this question with either yes or no to six innovation activities.

The results presented in Table 11 suggest that the Canadian wine industry is active in innovation activities. That is, a large majority of the overall sample declared having conducted internal R&D, accessed other external knowledge, acquired machinery, equipment and software, provided training, and conducted activities to ensure the commercial success of new or significantly improved product. The positive answers are respectively of 79.5%, 74.7%, 87.7%, 78.8% and 78.1%. These results tend to suggest that Canadian wine firms deploy extensive efforts to improve their current position. This is consistent with Cusmano et al. (2010), which indicate that New World Wine countries are very active in innovation in order to catch up with global players. Moreover, it reflects the results of Fensterseifer (2007) on the wine industry in Brazil, illustrating the importance of trial for wine quality improvement in industries in early development stage. In contrast, external R&D is rated to a lesser extent, with only 39.7%. Thus, the results may suggest that Canadian wine firms are more likely to develop innovations internally rather than externally.

Regarding the relationship between firms' characteristics and innovation activities, the results are not in line with our expectations. While we would expect size, age and type of production to influence firms' innovation activities, there are very few and consistent differences among firms. Indeed, there is an absence of statistically significant results, apart from firms producing *labrusca* that are more likely to acquire external knowledge. On that latter result,one may speculate that firms producing *labrusca* have a more limited knowledge base. However, a further investigation is required to verify this speculation.Thus, the very

few associations between firms' characteristics and innovation activities cannot provide support for Hypothesis 1.However, even though not statistically significant, the frequency indicates that the smallest firms of the sample and firms producing *labrusca* are associated with aslightly higher propensity to engage in innovation activities than their counterparts. This is consistent with the findings of Alonso (2010), whichindicatethat small wineries producing hybrid grape varieties from the Southern USA regions are very innovative.

As another result not in line with our expectations, regions do not appear as associated with firms' propensity of conducting innovation activities. This is, given the absence of significant results. Thus, the absence of association between regions and innovation activities do not provide support for Hypothesis 3.However, some minor variations are observed. For instance, firms in Quebec tend to be engaged more intensively to all the dimensions related to innovation activities than their counterparts. Perhaps, this may be explained by the earlier stage of development of the region. This may drive firms to deploy extensive innovation efforts in order to catch-up. However, the differences are not significant. Thus,even though the existence of superficial differences, the results may imply that Canadian wine firms conduct similar innovation activities, regardless of their location. This is consistent with the findings of Aylward (2004), who indicate that continuous product improvement is a key source of competitive advantage to all Australian wine-producing regions. Therefore, we may posit that Canadian wine firms have a relatively similar strategy regarding their efforts deployed towards innovation; they are very active and primarily focus on the improvement of their production.

Table 11 Innovation activities

	Total	Size			Year of creation			Production		Location		
		< 10	10-20	> 20	Before 1990	1990-2000	After 2000	Vinifera	Labrusca	BC	Ont.	Qc
n=	*146*	*86*	*48*	*12*	*18*	*51*	*77*	*106*	*40*	*49*	*57*	*40*
Internal R&D	79.5	81.4	77.1	75.0	88.9	76.5	79.2	76.4	87.5	73.5	78.9	87.5
External R&D	39.7	38.4	39.6	50.0	38.9	31.4	45.5	39.6	40.0	38.8	40.4	40.0
Acquisition of external knowledge	74.7	80.2	68.8	58.3	77.8	70.6	76.6	70.8	85.0*	71.4	70.2	85.0
Acquisition of equipment	87.7	89.5	85.4	83.3	100	86.3	85.7	84.9	95.0	81.6	87.7	95.0
Training	78.8	80.2	77.1	75.0	77.8	76.5	80.5	75.5	87.5	71.4	78.9	87.5
Commercial activities	78.1	81.4	72.9	75.0	72.2	82.4	76.6	76.4	82.5	69.4	82.5	82.5

***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level
If the dimension and the characteristics are significant, the * appears at the right of the column

7.1.3 Sources of information for innovation

In order to identify the sources of knowledge used for innovation, the questionnaire asked the following question: "How important were the following actors as sources of information for innovation in the last 3 years"? Firms had to rate the relative importance of the given actors as innovation knowledge sources on a Likert scale from 1 to 5, where 1 is not important, and 5 is crucial. Given that the collected data is ordinal indicators, we only considered actors rated as highly important sources of knowledge for innovation. Thus, to be considered, actors have to be weighted by firms as 4 or 5, which represents respectively very important and crucial source of knowledge for innovation.

The results presented in Table 12 illustrate that firms use several knowledge sources, but the importance is placed on the customers, followed by the exhibitions and trade fairs with respectively 74.0% and 60.3%. These two sources provide knowledge to respond directly to the market's needs. In the case of the Canadian wine industry, trade fairs and exhibitions represent opportunities to educate future consumers about their products and may represent an alternative distribution channel. The importance attributed to these sources may indicate a customer-driven production strategy, typically found in New World Winecountries (Taplin, 2011; Gilinsky et al., 2008; Tiffin and Kunc, 2011). Of much less importance are the higher educational and research institutes, and governments as knowledge sources for innovation. This result is rather surprising, given that non-pecuniary knowledge is diffused from CCOVI within the Canadian wine industry.

The results on firms' characteristicsdo not show an existence of relationships between the sources of knowledge and firms' size and type of vine cultivated.The similarity among firms on the basis of their size is rather surprising, given that we would expect larger firms to deploy more extensive resources to access knowledge from various sources as shown in Giuliani (2007). In addition, we would expect firms producing *labrusca* and hybrid to access knowledge from a variety of sources in order to gather wine-producing knowledge on their unique grape varieties as shown in the results of Alonso (2010). However, firms' age has some significant associations with few dimensions.The youngest firms reported accessing

knowledge to a greater extent from competitors, service firms and colleges. Thus, the higher likelihood of the youngest firms to access knowledge from these actors may indicate a greater innovation "openness". If knowledge is cumulated over time, we may speculate that the youngest firms have a limited knowledge base, which may drive their propensity to access knowledge from external actors. Since only age appears as associated with few dimensions, results on the sources of knowledge from innovation provide only partial support to Hypothesis 1.

Regarding the relationship between firms' location and sources of knowledge for innovation, the results are not in line with our expectations. While we would expect the sources of knowledge to vary across regions, there is a lack of consistent differences among firms. The only significant result indicates that firms located in Ontario are more likely to access knowledge from suppliers. Thus, the quasi absence of association between regions and the sources of knowledge for innovation do not provide support to Hypothesis 3. However, one should note that the frequency indicates that the sources of knowledge for innovation of Ontario differ from those of British Columbia and Quebec. Firms located in Ontario have a higher frequency to access knowledge from market actors and actors from other sources. This may indicate that firms located in Ontario are more likely to develop innovation based on external knowledge. However, these differences are not statistically significant. Therefore, the results suggest that the sources of knowledge for innovation are rather similar among the Canadian wine industry.

Table 12 Sources of knowledge for innovation

	Total	Size			Year of creation			Production		Location		
		< 10	10-20	> 20	Before 1990	1990-2000	After 2000	Vinifera	Labrusca	BC	Ont.	Qc
n=	*146*	*86*	*48*	*12*	*18*	*51*	*77*	*106*	*40*	*49*	*57*	*40*
Market sources												
Clients and customers	74.0	77.9	70.8	58.3	72.2	74.5	74.0	72.6	77.5	67.3	77.2	77.5
Suppliers	56.9	54.7	60.4	58.3	61.1	52.9	58.4	58.5	52.5	46.9	68.4	52.5*
Competitors	41.8	47.7	33.3	33.3	27.8	29.4	53.2**	42.5	40.0	32.7	50.9	40.0
Business service companies	32.9	36.0	27.1	33.3	27.8	17.6	44.2**	29.2	42.5	26.5	31.6	42.5
Institutional sources												
Universities	22.6	22.1	20.8	33.3	16.7	15.7	28.6	19.8	30.0	16.3	22.8	30.0
Colleges/technical institutes	23.3	25.6	20.8	16.7	5.6	13.7	33.8**	22.6	25.0	24.5	21.1	25.0
Federal government agencies	19.9	19.8	14.6	41.7	22.2	9.8	26.0	20.8	17.5	20.4	21.1	17.5
Provincial government agencies	17.8	19.8	10.4	33.3	16.7	15.7	19.5	17.0	20.0	14.3	19.3	20.0
Other sources												
Industry associations	37.7	36.0	35.4	58.3	50.0	25.5	42.9	40.6	30.0	34.7	45.6	30.0
Conf., trade fairs, exhibitions	60.3	60.5	56.3	75.0	66.7	60.8	58.4	60.4	60.0	57.1	63.2	60.0

***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level
If the dimension and the characteristics are significant, the * appears at the right of the column

7.1.4 Types of innovation development

In order to determine the types of innovation developed, the survey inquired the following question: "During the last three years, 2006-2009, did your establishment introduce new or significantly improved […]". Firms were asked to answer with yes or no to the following types of innovation: products, growing techniques, production techniques, managerial techniques, and marketing strategies.

Several interesting observations emerge from the results presented in Table 13. Given the very high proportion of innovation introduced to most categories, this indicates that the Canadian wine industry is very innovative. Canadian wine firms innovate primarily through products, which have been introduced by the majority of the overall sample (84.2%). This proportion is particularly high in comparison to other industries (see Heidenreich, 2009). Moreover, this could be inherent to the developmental features of the wine industry in New World Wine countries, where product innovation is one of the key strategies implanted, in order to remain competitive (Taplin, 2011; Centonze, 2010). In addition, firms have introduced new growing techniques and production techniques to a similar proportion (53.4% and 56.2%), which posits that these two are interrelated elements. Indeed, the roots of these innovations relate to the wine production process, lying in different activities associated with mechanical harvesting, grape stocks irrigations practices and tasting, to other activities such as control of winemaking practices. These innovations are generally assumed to lead to substantial advantages of wine industries (Smith and Marsh, 2007). Furthermore, the Canadian wine industry introduces very little new managerial techniques. This might be symptomatic of the early stage of development of the Canadian wine industry, which pressures firms to focus their efforts on the product improvement and least on the internal efficiency.

Unexpectedly, firms' propensity to introduce diverse innovation types appears as rather similar with respect to their characteristics. Indeed there are very few statically significant results with the dimensions of size, age, and types of grape varieties. This is conflicting with

our expectations that young, small and firms producing *labrusca* grape varieties would be more innovative. Thus, the results on the types of innovation development do not provide support to Hypothesis 1. In addition, this result is also inconsistent with the findings of Aylward (2002), which suggest that small wineries are likely to consider themselves as on the leading edge of product innovation and experimentation.

With respect to the types of innovation introduced and the regions, we do not have a totally clear and consistent picture. Overall, the results seem to suggest that there are little differences in terms of reported innovation rates in the three wine-producing regions, given the absence of statistically significant results. Thus, we do not found support for Hypothesis 3. However, if we look more closely at the results, firms in Quebec appear to claim slightly more innovations than firms in Ontario and British Columbia. This result can be partly explained by two elements, which may force firms to experiment and develop innovation themselves. First, there is a lack of organisations supporting and coordinating the industry in the region of Quebec. Second, the growing conditions (cold climate) and varietals (hybrid) also reduce the applicability of knowledge developed elsewhere. While this is not necessarily the case for firms in Ontario and British Columbia, which grow grape varieties found in other places, and they may benefit of knowledge developed by their support infrastructure. In consequence, firms from these regions can apply knowledge already developed by others.

Table 13 Types of innovation development

	Total	Size			Year of creation			Production		Location		
		< 10	10-20	> 20	Before 1990	1990-2000	After 2000	Vinifera	Labrusca	BC	Ont.	Qc
n=	*146*	*86*	*48*	*12*	*18*	*51*	*77*	*106*	*40*	*49*	*57*	*40*
Product	84.2	83.7	87.5	75.0	77.8	82.4	87.0	82.1	90.0	75.5	87.7	90.0
Growing techniques	53.4	54.7	52.1	50.0	72.2	43.1	55.8	50.0	62.5	51.0	49.1	62.5
Production techniques	56.2	54.7	56.3	66.7	66.7	51.0	57.1	53.8	62.5	53.1	54.4	62.5
Managerial techniques	20.5	25.6	14.6	8.3*	27.8	17.6	20.8	17.9	27.5	16.3	19.3	27.5
Marketing strategies	51.4	53.5	47.9	50.0	27.8	60.8	50.6	50.0	55.0	49.0	50.9	55.0

***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level
If the dimension and the characteristics are significant, the * appears at the right of the column

7.1.5 Innovation barriers

This section examines whether innovation barriers vary according to firms' characteristics. In order to identify the innovation barriers of the Canadian wine industry, the survey posed the following question: "During the three years, 2006-2009, how important were the following problems and obstacles for slowing down or causing problems for your innovation activities or innovation projects?" Firms were asked to rate the relative importance of economic, enterprise and juridical innovation barriers on a scale from 1 to 5, were 1 is not important and 5 is crucial.Given that the collected data is ordinal indicators, we limit our analysis to innovation barriers perceived as important. Thus, to be considered, innovation barriers have to be weighted by firms as 4 or 5, which represents respectively very important and crucial.

Results presented in Table 14 indicate that many obstacles hamper firms' innovation. The most important is the lack of funds followed by the lack of external funding and high innovation costs, with an occurrence of 54.1%, 46.6% and 43.2% respectively. Thus the most important obstacles to innovation represent economical factors. This result may be explained by the very small size of firms, which is likely to lead to a lack of financial resources for innovation (Caceres et al., 2011;Thornhill et al., 2004). However, access to both knowledge and collaboration partners for innovation do not appear to be an issue for innovation. This is, because the barriers lack of information on technology and the difficulty of identifying innovation partners have both low occurrence of 21.2 and 21.9%. This may indicate that Canadian wine firms are generally aware of the availability of these resources.

Regarding the associations of firms' characteristics with the barriers to innovation, the results partly meet our expectations.Some characteristics appear as associated with the types of innovation barriers. The results show that the smallest, and youngest firms as well as those growing *labrusca* are more likely to be hampered by the cost of innovation. Thus, we may suggest that these firms are constrained by their lack of resources. In addition, firms growing *labrusca* are more likely to recognise the lack of information on technology and the

difficulty to identify innovation partners, as important barriers. This may concurs that firms growing *labrusca* have a restrain pool of potential partners, given the particularities of their vines. Furthermore, the smallest firms are more likely to find a lack of information on technology. Thus, the few associations between the characteristics of firms and the innovation barriers provide partial support to Hypothesis 1.

Region also appears to have a certain association with firms' innovation barriers. In comparison to British Columbia and Ontario, firms from Quebec are more likely to be hampered by the following obstacles: innovation costs too high, lack of information on technology and difficulty to identify cooperation partner for innovation project. This may suggests two things: first, that Quebec firms may lack considerably more resources. Second, the better institutional endowment of British Columbia and Ontario diffuse knowledge that may overcome certain innovation obstacles regarding the level of knowledge base of the industry. Thus, the few associations between the firms' characteristics and the innovation barriers provide partial support to Hypothesis 1. Therefore our results indicate that innovation obstacles may vary to some extent with respect to firm's characteristics and region.

Table 14 Innovation barriers

	Total	Size			Year of creation			Production		Location		
		< 10	10-20	> 20	Before 1990	1990-2000	After 2000	Vinifera	Labrusca	BC	Ont.	Qc
n=	*146*	*86*	*48*	*12*	*18*	*51*	*77*	*106*	*40*	*49*	*57*	*40*
Lack of internal funding	54.1	59.3	43.8	58.3	33.3	64.7	51.9	51.9	60.0	49.0	54.4	60.0
Lack external funding	46.6	47.7	47.9	33.3	55.6	37.3	50.6	46.2	47.5	49.0	43.9	47.5
Innovation costs too high	43.2	57.0	22.9	25.0***	27.8	37.3	50.6**	35.8	62.5**	42.9	29.8	62.5**
Lack of qualified personnel	39.7	38.4	45.8	25.0	38.9	37.3	41.6	38.7	42.5	36.7	40.4	42.5
Lack of information on technology	21.2	29.1	10.4	8.3**	11.1	25.5	20.8	16.0	35.0**	16.3	15.8	35.0*
Difficulty of identifying partners	21.9	26.7	12.5	25.0	11.1	21.6	24.7	16.0	37.5**	20.4	12.3	37.5**
Inability to devote staff	50.7	47.7	60.4	33.3	50.0	52.9	49.4	36.3	14.4	51.0	49.1	52.5
Feasibility risks	26.0	29.1	18.8	33.3	27.8	33.3	20.8	22.6	35.0	22.4	22.8	35.0
Governmental regulations	38.4	34.9	47.9	25.0	16.7	41.2	41.6	39.6	35.0	32.7	45.6	35.0

***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level
If the dimension and the characteristics are significant, the * appears at the right of the column

7.1.6 Summary

This section presented the innovation dynamics of the Canadian wine industry along with firm's characteristics. The results can be summarise has threefold. First, the Canadian wine industry is very innovative considering the important efforts attributed to the innovation activities and the innovations developed. The main focus of innovation appears to be toward product and process improvements. The industry also accesses a variety of knowledge sources for innovation, essentially from market sources. This innovation behaviour is rather similar to other wine industries in early stage of development, characterised by a customer-driven strategy, where the main efforts are focused on the improvements of products and processes (Centonze, 2010; Cusmano, 2010; Taplin, 2010). The most important innovation barriers may reflect the lack of financial resources of the Canadian wine firms.

Second, the results are rather not consistent with our expectations given that only few associations are identified between firms' characteristics and innovation dynamics. Thus, it appears that the innovation strategy do not differ greatly through the industry. This finding is inconsistent with empirical findings from other wine-producing areas, suggesting that firms' characteristics influence innovation (Alward, 2002; Guiliani, 2007; Morisson and Rabelotti, 2009).

Third, given the disparity in the regional contexts of British Columbia, Ontario and Quebec, we expected firms to display different innovation dynamics across regions. However, the results are not clear: the findings show that regional characteristics do not matter very much when explaining innovation. Despite the historical and territorial differences existing between the three wine-producing regions, firms innovate and perform rather similarly. This finding is inconsistent with the work of McDermott (2007), which demonstrates that innovation variation within Argentinian wine-producing regions is subsequent to their institutional differences.

7.2 Innovation and collaboration

7.2.1 Introduction

This section presents the empirical results on collaboration within the Canadian wine industry. Building upon the work of Doloreux and Lord-Tarte (2012b), four analyses are conducted and presented in this section. The first and second analyses compare the characteristics and innovation dynamics of collaborators and non-collaborators. The third examines the type of actors involved in collaborations for innovation related activities. Finally, the fourth analysis explores the spatial distribution of collaboration.

7.2.2 Characteristics of collaborators

This section presents the demographic profile of collaborators. Collaborators are identified as firms who positively answered: "Did your establishment co-operate with other businesses or organisations for innovation related activities during the last three year?"

First, the results presented in Table 15 show that with 75 collaborators, almost half of the sample is collaborating. This relatively high proportion of firms engage in collaboration is consistent with Taplin (2010) and Alonso (2010), which demonstrate that wine firms in early developmentalstages are likely to be highly engaged in collaboration. Second, the table do not provide evidence of characteristic' differences between collaborators and non-collaborators. Thus, the high proportion of collaboration is consistent through the different firms' characteristics. This may tell us that the value and benefits of collaboration are very recognised among Canadian wine firms, regardless of their characteristics. Moreover, as indicated in the previous section, innovation of firms is likely to be hampered by economical obstacles; thus one may speculate that collaboration is one of the ways to overcome this issue by complementing firm' internal innovation capabilities through the expertise and skills from their external partners (Dahlander and Gann, 2010). As pointed in the methodological limitations, there is a 10 percent chance that we would legitimately recognise an association between two events, which may occur by coincidence. Since the number of observations in each subgroup is relatively small, it leverages this risk.

Table 15 Collaborator characteristics

	Cooperation	No-cooperation
n=	*75*	*71*
Firms characteristics		
Age (years) (mean)	10.4	9.6
Employees (mean)	9.07	9.28
Oenologists and/or agronomist (yes/no)	51 (68%)	40 (56%)
Production of vinifera varieties	58 (77%)	48 (68%)
Location characteristics		
British Columbia	29 (39%)	20 (28%)
Ontario	29 (39%)	28 (39%)
Quebec	17 (23%)	23 (32%)

***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level

7.2.3 Innovation dynamics of collaborators

In order to investigate the innovation dynamics of collaborators, the following dimensions are examined: innovation activities, knowledge sources, innovation types, innovation barriers, and innovation intensity. The results presented in Table 16 do not correspond to our expectations (see Chapter 4). There are few apparent differences in innovation dynamics between firms collaborating for innovation and those that do not. Before presenting the results, one must be careful in their interpretation, since the few significant results are subject to bias given the large amount of bivariate chi-square tests conducted on the same data set. More specifically, because we are certain at "only" 90 percent that the chi-square is different from 0, there is a 10 percent chance that it is 0. Since Table 16 has 33 tests and these are only 90% certain, then there is a probability that three or four false positive will be found. Thus, since no one can know which results is a false positive, this section focuses on the main finding of the table, which is that we do not find apparent statistical differences between the subgroups.

The results on the innovation activities do not provide evidence of differences between collaborators and non-collaborators. This is rather surprising, since literature tends to agree

that firms engage in collaboration have a high knowledge base and a high absorptive capacity (Casadesus-Masanell, 2010; Chesbrough, 2003; Van de Vrande et al., 2009). Thus, one would expect firms engage in collaboration to be more likely to conduct innovation activities in order to enhance and maintain their internal knowledge base. However, the results do not provide evidence that firms engage in collaboration differ from those that do not in terms of innovation activities.

In addition, the results do not provide evidence that collaboration is associated with the sources of knowledge for innovation. Subsequently, this indicates that non-collaborators access knowledge from external partners to some extent. This may suggest a certain degree of innovation "openness" for firms not engage in collaboration. This result might indicate the importance of social interactions with external partners and external sources of knowledge for innovation in the Canadian wine industry.

With respect to the types of innovation develop and the technological intensity, the results do not provide evidence that firms engage in collaboration differ from those that do not. This finding is rather surprising, given that one would expect collaborators to have more innovation outputs than non-collaborators. This is also inconsistent the literature on innovation, which generally agrees on the association between collaboration and innovation and which lends to support that firms engage in collaboration have a higher propensity to introduce product, process, and organisational innovations (Baba et al., 2009; Chesbrough, 2003; Tödtling et al., 2009). Thus, we do not find that firms engage in collaboration have more innovation outputs than non-collaborators.

Finally, with respect to the innovation barriers, the results do not provide evidence that firms collaborating differ from those that do not. This result is surprising since literature concurs that collaboration enhance firms capabilities (Giuliani and Bell, 2005; Van de Vrande et al., 2009). Thus, one might expect firms engage in collaboration to be better prepared to overcome innovation obstacles. However, the results cannot provide evidence that the innovation obstacles are less important to collaborators in comparison to non-collaborators.

Thus, the results on the innovation dynamics do not provide evidence of differences between the subgroups. Therefore, Hypothesis 2A cannot be confirmed since we do not find that collaborators are more innovative than non-collaborators.

Table 16 Innovation dynamics of collaborators and non-collaborators

	Cooperation	No-cooperation
n=	*75*	*71*
Innovation activities		
Internal R&D	58 (77%)	58 (82%)
External R&D	36 (48%)	22 (31%)**
Acquisition of mach., equip. and software	67 (89%)	61 (86%)
External knowledge	56 (75%)	53 (75%)
Training	59 (79%)	56 (79%)
Commercial activities	60 (80%)	54 (76%)
Knowledge sources		
Clients and customers	52 (69%)	56 (79%)
Suppliers	36 (48%)	47 (67%)**
Competitors	31 (41%)	30 (42%)
Business service companies	24 (32%)	24 (34%)
Universities	19 (25%)	14 (20%)
Colleges/technical institutes	15 (20%)	19 (27%)
Federal government agencies	13 (17%)	16 (23%)
Provincial government agencies	14 (19%)	12 (17%)
Industry associations	29 (39%)	26 (37%)
Conf., trade fairs, exhibitions	47 (63%)	41 (58%)
Innovation development		
Product	66 (88%)	57 (80%)
Growing techniques	36 (48%)	42 (59%)
Production techniques	42 (56%)	40 (56%)
Management	20 (27%)	10 (14%)*
Marketing	45 (60%)	30 (42%)**
Technological intensity		
No innovation	2 (3%)	5 (7%)
1-2 innovations	20 (27%)	17 (24%)
3-4 innovations	20 (27%)	25 (35%)
More than 4 innovations	33 (44%)	24 (34%)
Innovation barriers		
Lack on internal funding	34 (45%)	45(63%)**
Lack of external funding	31 (41%)	37 (52%)
Innovation costs too high	29 (38%)	34 (48%)
Lack of qualified personnel	29 (39%)	29(41%)
Lack of information on technology	15 (20%)	16 (23%)
Difficulty to devote staff	31 (41%)	43 (61%)**
Feasibility risks	18 (24%)	20 (28%)
Governmental regulations	29 (39%)	27 (38%)

* Sig. ≤0.1.; ** Sig. ≤0.05.; *** Sig. ≤0.01.

7.2.4 Occurrence of collaboration

This section examines the types of actors involved in collaborations tied to product development. The results presented in Table 17 indicate that the 75 firms cooperating from our sample have established a total of 424 collaboration ties. On average, firms have 5.6 collaborations for product development. Thus, Canadian wine collaborators have a relatively well-developed collaboration network.

Overall, the results show that firms in the Canadian wine industry are significantly more connected with suppliers, competitors, and service firms. Indeed, on average, firms have 2.8 collaboration agreements, and, in terms of occurrence, 49% have established collaborative relationships with other firms for a total of 211 ties. These actors may provide market knowledge (Tödtling et al. 2009), which is generally oriented toward more practical matters. In contrast, public organisations (universities, colleges, research institutes, and industry associations) represent 45% with an average of 1.9 collaboration agreements. Thus, actors that may provide scientific and crucial knowledge are partners to a much lesser extent in comparison to other firms. Furthermore, only 40% of collaborations have been tied with clients. Since clients are a very important source of knowledge, we expected them to be an important collaboration partner. However, one should note that as opposed to the other classifications, client does not aggregate collaboration with other partners.

Table 17 Occurrence of external collaboration

Type of relation	Occurrence			Total number of ties
	Yes	No	Total	
Total external collaborations of which:				
Firm-to-clients	58 (40%)	88 (60%)	146 (100%)	72
Firm-to-other firms	71 (49%)	75 (51%)	146 (100%)	211
Firms-to-public organisations	66 (45%)	80 (55%)	146 (100%)	141
All	75 (51%)	71 (49%)	146 (100%)	424

7.2.5 Spatial distribution of collaborations

Concerning the spatial distribution of collaboration, the analysis is based on three different spatial distributions of partners, namely: regional, national, and international. Table 18

summarises the descriptive results and shows that for all types of partners, collaborations are mostly happening within the regional level. Indeed, the majority of these collaborations are regional (57%). Surprisingly, national partners are not engaged to a greater extent than international partners. Firms show a similar propensity to establish national and international collaborations (22% and 21%).

Looking at the different types of partners and their geographical distribution, we can see that firms have more links with clients in their own region than elsewhere. Interestingly, collaboration with clients is more common with international partners than national partners. This result might be explained by the legislations that strictly regulate the alcohol trade flow across Canadian provinces. Thus, we may speculate that if a firm wants to expand its market, international exportation might be easier and than interprovincial sales. Furthermore, at the regional level, other firms is the most important type of partner. This may suggest that the scope of these collaborations is specific to the regional context. At the national level, the most important type of partner is public organisations. This may suggest that the scope of some Canadian public organisations outreach their provincial boundaries. At the international level, other firms is the most important type of partner. This may indicate that other firms are important in domain less regional specific. For instance, Canadian wine firms might buy standardised equipment from suppliers at the international level.

Summing up, the findings indicate that the regional collaborations are the most important, while national and international ones are of less importance. Therefore, collaborations are not relevant at all spatial scales.

Table 18 Spatial distribution of collaborations

Type of relation	Spatial distribution					All
	Regional	National	Foreign			
			All	NWC*	TWC**	
Total external collaborations of which:						
Firm-to-clients	55 (76%)	8 (11%)	9 (13%)	7 (10%)	2 (3%)	72 (100%)
Firm-to-other firms	106 (50%)	48 (23%)	57 (26%)	28 (13%)	29 (13%)	211 (100%)
Firms-to-public organisations	80 (56%)	38 (27%)	23 (17%)	18 (13%)	5 (4%)	141 (100%)
All	241 (57%)	94 (22%)	89 (21%)	53 (13%)	36 (8%)	424 (100%)

Note: * NWC'new world countries' **TWC 'traditional wine countries

7.2.6 Summary

What does the analyses above demonstrate about collaboration within the Canadian industry? Collaboration is engaged at a relatively high proportion, as almost half of the sample in the study is collaborating. These are tied primarily at the regional level and with other firms. This is consistent with the results of Alonso (2010) and Taplin (2010), who argue that wine producing regions in their early stage of development are characterised by a high density of collaboration among firms, and strive toward a common goal, which is regional recognition. In addition, collaboration at the regional level and tied with other firms may not involve extensive internal resources. Subsequently, these are likely to be accessible for most of the wineries. This may explain the little variation of characteristics between collaborators and non-collaborators.

The results do not provide evidence that innovation dynamics differ among firms collaborating from those that do not. As opposed to our expectations, the results do not indicate that collaborators are more innovative than non-collaborators. Thus the results do provide support to Hypothesis 2A, which cannot be confirmed. This finding is inconsistent with the literature on innovation (Chesbrough, 2003; Baba et al., 2009; Van de Vrande et al., 2009 Tödtling et al., 2009)as well as with the empirical findings from the wine industry in other wine-producing countries (Giuliani 2007; Morrison and Rabelloti, 2009).

Moreover, results show that not only collaborations are not relevant at all spatial scale, but also that national collaborations are generally not much more important than international collaborations. This little proportion of collaboration at the national level might be associated with the legislations strictly regulating the alcohol trade flow across the Canadian provinces.

7.3 Collaboration with HEIs

7.3.1 Introduction

This section presents the empirical results on collaboration tied specifically with HEIs and its association with innovation. In order to do so, three distinct analyses are conducted and

presented. The first is the characteristics of HEIs collaborators. The second is the reasons to cooperate with HEIs. Finally, the third is the innovation dynamics of HEIs collaborators.

7.3.2 Characteristics of firms collaborating with HEIs

To distinguish firms co-operating with HEIs from firms who do not, we rely on the following question asked in the survey: "Did your establishment co-operate with universities/colleges and other higher education institutes (yes or no)". The results presented in Table 19, show that a third of the sample (55 firms) has cooperation arrangements with HEIs. As acknowledge in the methodological limitations, one should note that the small number of observations in the subgroup HEIs collaborators may hampers the robustness of the statistical analyses.

The results show that HEIs collaborators are larger in size and less likely to subcontract the services of winemakers in comparison with those that do not collaborate with HEIs. If we assume that winemaker's skills are mandatory to the wine production, we may posit that to not subcontract winemaking services would indicate that firms have a relatively higher knowledge base by having these capacities internally. This is coherent with the literature that demonstrates that large size and high knowledge base are firms' preconditions to engage in collaboration with HEIs (Asheim et al., 2003; Kaufmann and Tödtling, 2001; Tödtling et al., 2009). In addition, most HEIs co-operators are located in British Columbia and Ontario, while fewer are located in Quebec. This result is rather expected, given the absence of HEIs specialised in the wine industry located in Quebec.

Table 19 Characteristics of HEIs collaborators and non-collaborators

	Industry-university cooperation	
	Cooperation	No-cooperation
	(n=55)	*(n=91)*
Firms characteristics		
Age (years) (mean)	9.53	10.34
Employees (mean)	11.36	7.85**
Oenologists and/or agronomist (yes/no)	33(60.0%)	55(60.4%)
Subcontracting services of winemaker (yes/no)	14(26%)	41(45%)**
Location characteristics		
British Columbia	21(38.2%)	28(30.8%)
Ontario	22(40.0%)	35(38.5%)
Quebec	12(21.8%)	28(30.8%)

* Sig. ≤0.1.; ** Sig. ≤0.05.; *** Sig. ≤0.01.

7.3.3 Motivations to collaborate with HEIs

In order to gather data on the motivations for firms to collaborate with HEIs, the survey asked the following question to HEIs collaborators: "Please indicate the importance of the following services and activities undertaken with universities, colleges and other higher education institutes".Thereby, survey respondents were asked to rank the relative importance of the given reasons on a scale from 1 to 5, where 1 is not important, and 5 is crucial.

Results summarised in Table 20 indicate that the maximum relative mean score is only 3.31. The distribution and the mean value demonstrate that the main reason for firms to collaborate with HEIs is to benefit from continuing education for their employees followed by the use of students on work placement. In contrast, the least claimed motivation to collaborate is to share employees, followed by to share facilities. Thus, firms' main motivations to collaborate with HEIs are to leverage their workforce capabilities. This reason is rather surprising given that other studies have demonstrated that HEIs-collaborators provide great benefits to innovation by providing critical and scientific knowledge that firms cannot create themselves (Dell'era and Bellini, 2009; Kaufmann and Tödtling, 2001).

Table 20 Canadian wine firms' motivations to collaborate with HEIs

	Not important (1;%)	Moderately important (2;%)	Important (3;%)	Very important (4;%)	Crucial (5;%)	Mean
Work placement	18.2	12.7	30.9	18.2	20	3.09
Recruitment	23.6	16.4	23.6	27.3	9.1	2.82
Joint R&D project	23.6	18.2	27.3	23.6	7.3	2.73
Sharing facilities	32.7	29.1	21.8	10.9	5.5	2.27
Research and advice	23.6	12.7	34.5	21.8	7.3	2.76
Continuing education	14.5	5.5	32.7	29.1	18.2	3.31
Sharing employees	41.8	27.3	14.5	7.3	9.1	2.15

7.3.4 Innovation and collaboration with HEIs

With respect to the innovation dynamics of HEIs collaborators, the following dimensions are used: innovation activities, knowledge sources for innovation, types of innovation developed, and innovation intensity. The results presented in Table 21 are not in line with the expectations of this thesis (see Chapter 4). There are few apparent differences in innovation dynamics between firms collaborating with HEIs for innovation and those that do not. One must be careful in interpreting the results since the few significant results are subject to bias given the large amount of bivariate chi-square tests conducted on the same data set. More specifically, because we are certain at "only" 90 percent that the chi-square is different from 0, there is a 10 percent chance that it is 0. Since the table has 33 tests and these are only 90% certain, then there is a probability that three or four false positive will be found in the table. Thus, since no one can know which results is a false positive, this following section focuses on the main finding of the table, which is that we do not find apparent statistical differences between firms collaborating with HEIs and those that do not.

The results on the innovation activities do not provide evidence of differences between firms collaborating with HEIs and firms that do not. Thus, we cannot say that firms engage in collaboration with HEIs are different with respect to innovation activities. Thus, whether firms collaborate or not with HEIs, the main focus of the innovation activities remains toward internal R&D. Moreover, given the earlier observation that the main reason for firms to collaborate with HEIs is to benefit from continuing education for their employees, one might expected training to be more important to HEIs collaborators. In contrast, the

frequency to conduct training is just slightly higher for HEIs collaborators, and this result is not apparent. Since the high level of participation in training reported by all firms, it would seem that training is a concern shared among all Canadian wineries. Or, more specifically, it would seem that collaborating with HEIs for innovation does not associate with a greater likelihood of engaging in training.

In addition, the results do not provide evidence that collaboration with HEIs has some associations with the sources of knowledge for innovation. Since HEIs are part of the category "institutional" actors, one might expect HEIs collaborators to be more likely to access knowledge from other institutional sources such as universities, colleges and government agencies. Although the frequency indicates that HEIs collaborators access knowledge from institutional sources slightly more than non-collaborators, we cannot indicate a clear relationship between collaboration with HEIs and the access to institutional sources of knowledge. Customers are still the most important source of knowledge for innovation to HEIs collaborators.

With respect to the types of innovation develop and to the technological intensity, the results do not provide evidence that firms engage in collaboration with HEIs differ from those that do not. This finding is inconsistent with literature, which concurs that HEIs are crucial innovation partners by providing scientific and critical knowledge that firms cannot develop themselves (Asheim et al., 2003; Kaufmann and Tödtling, 2001; Tödtling et al., 2009). Thus, we did not found that firms engage in collaboration with HEIs have more innovation outputs than HEIs non-collaborators.

Furthermore, with respect to the innovation barriers, the results do not provide evidence that firms engage in collaboration with HEIs differ from firms that do not. This is rather surprising since we would expect HEIs to enhance firms' ability to overcome innovation obstacles. The results indicate a relatively low and similar importance attributed to the obstacle "lack of information on technology" among all firms. This is inconsistent with the literature that shows that firms engage in collaboration with HEIs benefit from scientific

knowledge provided by this type of partner (Tödtling et al., 2009). Thus, the results cannot provide evidence that collaboration with HEIs enhance firms' ability to overcome innovation obstacles.

Thus, the results on the innovation dynamics do not provide evidence of differences among the subgroups. Therefore, Hypothesis 2B cannot be confirmed since the descriptive results did not show that firms engage in collaboration specifically with HEIs are more innovative than non-collaborators

Table 21 Innovation dynamics of HEIs collaborators and non-collaborators

	Cooperation	No-cooperation
n=	*55*	*91*
Innovation activities		
Internal R&D	44 (80%)	72 (79%)
External R&D	27 (49%)	31 (34%)*
Acquisition of mach., equip. and software	50 (91%)	78 (86%)
External knowledge	44 (80%)	65 (71%)
Training	47 (86%)	68 (75%)
Commercial activities	45 (82%)	69 (76%)
Knowledge sources		
Clients and customers	37 (67%)	71 (78%)
Suppliers	28 (51%)	55 (60%)
Competitors	19 (35%)	42 (46%)
Business service companies	18 (33%)	30 (33%)
Universities	16 (29%)	17 (19%)
Colleges/technical institutes	15 (27%)	19 (21%)
Federal government agencies	12(22%)	17 (19%)
Provincial government agencies	12 (22%)	14 (15%)
Industry associations	23 (42%)	32 (35%)
Conf., trade fairs, exhibitions	34 (62%)	54 (59%)
Innovation development		
Product	50 (91%)	73 (80%)*
Growing techniques	27 (49%)	51 (56%)
Production techniques	34 (62%)	48 (53%)
Management	16 (29%)	14 (15%)**
Marketing	35 (64%)	40 (44%)**
Technological intensity		
No innovation	1 (2%)	6 (7%)
1-2 innovations	15 (27%)	22 (24%)
3-4 innovations	13 (23%)	32 (35%)
More than 4 innovations	26 (47%)	31 (34%)
Innovation barriers		
Lack on internal funding	22 (40%)	57 (63%)***
Lack of external funding	22 (40%)	46 (51%)
Innovation costs too high	24 (44%)	39 (43%)
Lack of qualified personnel	23 (42%)	35 (39%)
Lack of information on technology	10 (18%)	21 (23%)
Difficulty to devote staff	24 (44%)	50 (55%)
Feasibility risks	17 (31%)	21 (23%)
Governmental regulations	25 (46%)	31 (34%)

* Sig. ≤0.1.; ** Sig. ≤0.05.; *** Sig. ≤0.01.

7.3.5 Summary

This section presented the results on HEIs collaborators within the Canadian wine industry by depicting the HEIs collaborators' characteristics, motivations to engage in collaboration, and innovation dynamics. The results indicate that only a small proportion of firms are engaged in collaboration with HEIs. In addition they are larger sized and less likely to subcontract the services of winemakers. This reflects the literature (Asheim et al., 2003; Bell and Giuliani, 2007; Kaufmann and Tödtling, 2001; Tödtling et al., 2009; Guiliani, 2007), which has shown that large size and higher knowledge absorptive capacity are preconditions of firms to engage in collaboration with HEIs. This may provide some explanation for the small proportion of the sample that engage in collaboration with this type of partner. Indeed, recalling the characteristics of the sample, firms are generally very small and the industry knowledge base is likely to be rather limited because of its young age.

Interestingly, firms are collaborating with HEIs mostly to leverage their workforce capabilities. This is rather surprising given that the literature agrees that co-operation agreements are tied with these actors in order to access critical knowledge while seeking complex innovation (Dell'era and Bellini, 2009; Kaufmann and Tödtling, 2001). This might be accountable for the little variation of innovation dynamics among HEIs collaborators and non-collaborators. We may posit that current investments in the workforce capabilities have the potential to generate innovation benefits, but these may only be noticeable in the future.

With respect to the innovation dynamics, the results are not in line with the expectations of this thesis. Indeed, the results do not provide evidence that firms engage in collaboration with HEIs are more innovative. Thus, the results do not provide support to Hypothesis 2B, which cannot be confirmed. This finding is inconsistent with literature on innovation (D'Este and Iammarino, 2010; Kaufmann and Tödtling, 2001; Lee, 2000; Lendel, 2010; Tödtling et al., 2009; Lester, 2005), which highlights the benefits associated with HEIs-industry linkages and their positive impact on innovation.

7.4 Conclusion

Overall, what are the key results of the empirical findings? With respect to the innovation dynamics of the industry, the results may suggest that the Canadian wine firms are very innovative. Indeed, the results on innovation activities indicate that they organise extensive efforts toward the improvement of their products and processes. They develop innovations to a large extent, generally of technological nature. In addition, one may speculate that the Canadian wine industry appears to follow a customer-driven strategy, by accessing knowledge mostly from customers as well as from other market sources. The most important obstacles to innovation are associated with economical issues. As opposed to our expectations, the innovation dynamics of firms vary little according to their characteristics and location. This may suggests that Canadian wine firms have a similar innovation dynamics, regardless of their characteristics and location.

Moreover, with respect to the importance of collaboration, the results indicate that a large proportion of Canadian wine firms are collaborating in order to develop product innovation. In addition, there is an absence of characteristic to distinct collaborators from non-collaborators. The results also indicate that collaborations are mostly tied with other firms, and principally at the regional level. Interestingly, national collaborations are just slightly more important than international collaborations. As opposed to our expectations, the results do not provide evidence that innovation dynamics differ between firms collaborating and firms non-collaborating. Thus, we cannot indicate that firms collaborating are more innovative.

As opposed to collaborations in general, the ones specifically with HEIs are tied to a lesser extent. We may posit that this small proportion is attributed to the characteristics of HEIs collaborators. Pointing their access to resources, these are larger and less likely to subcontract winemaking. Indeed, given the characteristics of the Canadian wine firms, very few firms in our survey have this profile. In addition, our results show that the main reasons for firms to collaborate with this type of partner are related with the improvement of workforce capabilities. In contrast to our expectations, the results do not provide empirical

evidence that innovation dynamics differ between firms collaborating with HEIs and those that do not. Thus, we cannot indicate that firms collaborating with HEIs are more innovative.

8 DISCUSSION AND CONCLUSION

8.1 Overview

This thesis examined the innovation and development of the Canadian wine industry. It presented evidence regarding the key development factors, innovation dynamics, and collaborations, with a particular emphasis on collaborations with higher education institutes. It also empirically assessed the extent to which there are systemic differences among the Canadian wine producing regions, namely British Columbia, Ontario and Quebec.

In light of the results presented, the key findings and contributions of this thesis shall be summarised. The following chapter discusses the key empirical findings, compares the wine industry of Canada to other wine-producing countries, presents the implications for both theory and practice, and finally suggests further areas of research.

8.2 Key findings to the research questions and related hypotheses

8.2.1 Salient features and characteristics of the industry's development

The first research question of this thesis investigated the salient features and characteristics of the Canadian wine industry development. The findings indicate that the industry has grown steadily during the last 30 years. Also, it is composed principally of micro firms and the total viticulture area is relatively small in comparison to global players such as France, USA, and Australia. Moreover, Canadian wine is mostly sold domestically and its production is highly concentrated in British Columbia and Ontario.

The wine industry in Canada has developed differently according to its regional context. Indeed, the institutional framework of the three wine regions has developed and functions in silos. This in turn causes a lack of institutional coordination in the industry. We can attribute this finding to the independent set of actions undertaken by the provincial governments after the FTA agreement. The support from the government of British Columbia was initially more centralised than Ontario, given that it provided programs to encourage the growth of

better grape varieties. However, both governments have carried out actions to create favourable development conditions. To improve, they have been targeting especially the knowledge infrastructure and wine quality management. In contrast, the development of Quebec's wine industry has been strongly hampered by government regulations. These have restrained the production and distribution of wine.

In light of these results, one may posit that the wine industries of British Columbia and Ontario have reached a similar and further development stage compared to Quebec, which is still in its debut. This finding might be associated with better human and physical conditions found in British Colombia and Ontario. Indeed, the climate conditions are more favourable and they also enjoy more developed and integrated institutions. In contrast, the climate in Quebec is harsher and the institutional framework is inefficient. In Quebec, there is an absence of an integrated knowledge infrastructure as well as a lack of critical mass of economic actors.

8.2.2 Innovation characteristics

The second research question investigated the innovation characteristics of the Canadian wine industry. Based on the literature on innovation and on the key empirical findings on the wine industry, two hypotheses were formulated regarding this research question. The first is on the relationship between innovation and firms' characteristics. More precisely, we expected innovation to differ according to firms' size, age and type of production. We didn't find support for this hypothesis, given that firms' characteristics do not display consistent and significant association with the innovation dynamic dimensions used in this study. This finding is unexpected and inconsistent with empirical findings from other wine producing areas, which stress that firm's internal characteristics play a fundamental role in shaping innovation (Alward, 2002; Guiliani, 2007; Morisson and Rabelotti, 2009).

To shed light on these results, one should note that firms in our sample share relatively similar characteristics, with regards to age and size. The entire sample is composed of small firms, since these are defined as "those with fewer than 50 employees" (OECD, 2002:183).

Thus, the similar innovation pattern among Canadian wine firms might be the result of their relatively similar small sizes and young age. Therefore, it can be suggested that they put considerable effort into the improvement of their products and processes, in order to grow and reach a further stage of development.

The second hypothesis concerned the relationship between innovation and the regional context. Given the difference among the wine industry of British Columbia, Ontario and Quebec, in terms of physical conditions and institutional endowments (see Chapter 6), we expected firms to display different innovation dynamics across the Canadian wine-producing regions. However, our results partly reject this hypothesis. Despite the historical and territorial differences existing between the three wine-producing regions, firms innovate very similarly. The results provide empirical confirmation of the absence of a regional-specific innovation pattern in the Canadian wine industry. This suggests that innovation is not specifically related to the regional context. This is supported by the fact that we found very few statistically significant differences with respect to the numerous innovation related variables analyzed. This finding is inconsistent with the literature on innovation (Fritsch and Schroeter, 2011; Hassink, 2005; Tödtling et al., 2011; Uyarra, 2009) as well as with empirical findings from the wine industry (Cusmano, 2010; McDermott, 2007), which concur that innovation is specific to the regional context of firms.

Although the results indicate that innovation dynamics of firms do not differ across regions, the results may not reflect the same realities. For instance, firms from Quebec might be very innovative because they are forced to take a trial and error approach to their wine production in order to overcome the province' lack of knowledge inherent to their institutional deficiencies and type of production. One may question the innovation benefits and risks of such an approach if firms experiment various techniques and knowledge, which are not tested previously. In contrast, when seeking to improve their products and processes, firms from British Columbia and Ontario have the possibility to apply knowledge previously experienced by others. This occurs because firms from these regions enjoy a better institutional framework, coordinating and diffusing knowledge and because they produce

better-known vines varieties. This leverage the chance of success and benefits of their innovation developed. Therefore, the high innovation rate of wine firms in Quebec might be very high for different reasons than British Columbia and Ontario and the benefits of innovation may differ accordingly.

This thesis provides evidence that Canadian wine firms are very innovative, and follow a rather similar innovation pattern, regardless of their characteristics and location. More specifically, the innovation activities and innovations developed focus on the improvement of products and processes and less on organisational innovations. This finding may be attributed to the early developmental stages and to the growing conditions of the Canadian wine industry. Canadian wineries may be pressured to discover and explore different ways to produce wine corresponding to their unique natural and physical conditions. The harsh Canadian climate involves the risk of very cold winters, which pressure firms to conduct innovations to prevent severe vine damage. Since the quality of their product is the core of their business, we may posit that firms are more likely to prioritise technological innovation over organisational innovation in order to reach a better market position. As firms grow and the industry develops, perhaps organisational innovations will gain importance, in particularly in relation to commercialisation and marketing.

Finally, the results of this study provide some indication of the market orientation of the Canadian wine industry. The Canadian wine production, like other producers in New World Wine countries appears to be customer-driven since customers and other market sources are identified as major sources of knowledge. This might be explained by the short history of Canada in winemaking: wines may still require legitimacy and recognition from customers. Therefore customers are considered as critical in the innovation process.

8.2.3 The nature of collaboration, its geographical distribution and with HEIs

Our third research question examined the nature of collaboration within the Canadian wine industry, its geographical distribution and more specifically, the importance of HEIs on innovation of firms. We formulated two hypotheses. The first was interested in the

relationship between collaboration and innovation. More precisely, we anticipated that collaboration would be important to provide new skills and knowledge and therefore firms engage in collaborations would be more innovative than those who do not collaborate. However, the results do not provide empirical evidence that collaborators and non-collaborators have different innovation dynamics. Thus, since the results do not provide evidence that collaborators are more innovative, we cannot confirm Hypothesis 2A. This finding is inconsistent with the literature on innovation (Chesbrough, 2003; Baba et al., 2009; Van de Vrande et al., 2009 Tödtling et al., 2009)as well as with researches on the wine industry (Giuliani 2007; Morrison and Rabelloti, 2009), which all agree that firms engaging collaboration are more innovative. Since firms collaborating share similar characteristics with those that are non-collaborators, one may speculate that the limited knowledge base of firms might provide some explanations to this result. Following the notion of absorptive capacity (Cohen and Levinthal, 1990), an insufficient knowledge base would prevent firms from gathering the full benefits of collaboration, because it would limit their ability to recognise the value of new opportunities and apply it to commercial ends.

Furthermore, the results show that other firms are the most important collaborative partners. In addition, collaborations are not relevant at all spatial scale because these are mostly regional. These results are consistent with the results of Alonso (2010) and Taplin (2010), who argue that wine-producing regions in their early stages of development are characterised by a high density of collaboration among firms. First, the nature of the wine industry may explain this since wine-producing knowledge is very specific to its regional context. In the case of Canada, we may suggest that the particularities associated with growing vines in a cold climate prevent firms from exchanging and absorbing wine-producing knowledge from other regions. As a result, a regional collaboration is important for firms to share knowledge that is probably specific to the *terroir* and therefore difficult to be transferred from one region to another. Second, we may posit that it is in a firm's best interest to share their skill and expertise with other local actors in order to leverage the regional knowledge base and capabilities. Indeed, individual firms would get the benefit of product quality improvement at the regional level, given that wine has a strong regional identity. Thus an individual winery is

likely to gain customer recognition alongside its region. Regarding collaboration at the national and international levels, these occur to a relatively similar extent. We may suggest that these are tied to gain and exchange non-regional specific knowledge. At the international level, firms are the most important type of partner. For instance, one may speculate that collaboration may be tied with suppliers of standardise wine making equipment. While at the national level, the most important type of partner is public organisations. This may reflect the interprovincial reach of some public organisations. For example, CCOVI and the Canadian wine growers are two organisations with a national mandate.

The second hypothesis of this research question relates to the relationship between innovation and collaboration with HEIs. More precisely, we expected collaboration with HEIs to be important to provide critical and scientific knowledge, which firms cannot create themselves. Therefore, we expected firms engage in collaboration with HEIs to be more innovative. However, the results do not provide empirical evidence of innovation dynamics differences between firms collaborating with HEIs and those that do not. Thus, since we do not have empirical evidence supporting that firms engage in collaboration with HEIs are more innovative, we cannot confirm Hypothesis 2B. This finding is inconsistent with the literature (D'Este and Iammarino, 2010; Kaufmann and Tödtling, 2001; Theter, 2002), which generally agrees that HEIs are valuable innovation partners to leverage firms' innovativeness by enhancing knowledge base and complementing internal R&D. Since HEIs collaborators represent a small proportion of the sample and we cannot confirm that they are more innovative, we may question the ability of the Canadian research system to reach and interact with wine firms. Since HEIs adapted to the Canadian wine industry are relatively recent, these may not have reached their full potential. Therefore, the industry may lack of technological gatekeepers having a central position in the network in terms of knowledge transfer to other regional firms. Consequently, this may limit the number of firms collaborating with them as well as gaining the potential benefits.

Moreover, HEIs collaborators are larger in size and less likely to subcontract the services of winemakers. This suggests that HEIs collaborators have a relatively higher knowledge base

if they possess winemaker' skills internally. This would be consistent with the literature suggesting that HEIs collaborators are larger and have a higher knowledge base (Asheim et al., 2003; Bell and Giuliani, 2007; Kaufmann and Tödtling, 2001). These characteristics also provide an explanation for the small proportion of the sample engages in collaboration with HEIs because few firms appear to have such traits. In addition, we found that the main reason for firms to engage in collaboration with HEIs is to leverage their workforce capabilities. This motive is inconsistent with the literature, which concurs that firms develop co-operation arrangements with HEIs to access critical knowledge (Dell'era and Bellini, 2009; Kaufmann and Tödtling, 2001). Given that these same scholars also agree on the direct benefits of HEIs collaboration on innovation, the motives to collaborate with HEIs may also provide some explanations for the absence of empirical evidence supporting the association between HEIs collaborations and innovation. Indeed, the development of employees' capabilities may generate great benefits, but these may take time to foster.

8.3 The wine industry in Canada in comparison to other wine-producing countries

In light of the results, where can we position the Canadian wine industry in comparison to other wine-producing countries? The emerging picture indicates that Canada has very specific conditions. Nevertheless, some of its innovation characteristics correspond to other wine-producing countries. At first blush, Canada may share similarities with New World Wine countries (NWW) such as Argentina, Australia and USA. For instance, the wine industry is very innovative and appears to be customer-driven. In addition, as found in NWW countries, the government (in the case of Ontario and British Columbia) has contributed organising the industry development and created a supportive infrastructure.

However, major differences prevent Canada fromfitting into that category. For instance, NWW countries are characterised by a scientific approach to innovation, where the role of HEIs and other public organisations is crucial. These countries generally have a high volume of exportation and a strategy oriented toward the mass production of standardised and

inexpensive wine. These elements are different with the Canadian wine industry, which is forced to adopt niche product segmentation due to its high cost and low volume of production. In addition, the wine is domestically consumed and collaboration with HEIs is not frequent. Furthermore, the Canadian wine industry differs by its very harsh climate conditions, its strict regulations, and also by being composed of very small and young wineries.

One should note that the literature on the development and innovation of the wine industry mostly focuses on well-established countries, which whom Canada share very few elements. As Canada, a group of new wine-producing countries with non-traditional climate conditions has recently emerged. Among others, such countries include China, Morocco and Belgium. This raises the question whether these countries would share a relatively similar innovation and whether the Canadian wine innovation pattern would correspond better to such countries.

8.4 Implications for theory

With respect to the theoretical implications, what lessons are drawn from the empirical findings concerning innovation dynamics and the development of the Canadian wine industry? First, the results of this thesis appear inconsistent with the literature, which has shown that firm's internal characteristics and location play a fundamental role in shaping innovation. These results question the general assumption among scholars of the influence of these factors and suggest examining, more precisely the characteristics and dynamics of the sector and its stage of development.

Second, this thesis has provided empirical support that wine firms are not isolated entities. Aiming at product development, Canadian wine firms gathered knowledge from multiple sources and many have collaboration arrangements. Since the results indicate that firms that engage in collaboration are not more innovative, it also brings nuance to the literature that stresses the benefits of collaboration on a firm's ability to innovate.

Third, the results indicate that to the Canadian wine industry, the advantages of geographical proximity are critical given that collaboration for product development is strongly embedded in regional networks. This bring nuance to the literature that emphasises that innovative firms are not only engaged in local collaboration, but also in extra-regional ones. Therefore, it can be suggested for some industries, such as the wine industry, that the innovation learning process is highly localised. This might be subsequent to the importance of region specific wine-producing knowledge, which is likely to be tacit and difficult to transfer from one wine-producing region to another.

8.5 Implications for practice

This thesis has additionally provided some valuable insights for policy-makers. First, it provides empirical confirmation that the Canadian wine industry is a highly innovative sector. If innovation has been greatly emphasised in high-tech, and manufacturing sectors, this thesis posit that policy-makers should not neglect the importance of innovation in agriculture sectors, or at least in the wine industry.

Second, this thesis highlights the role and importance of the government's top-down strategies in the development of the Canadian wine industry. It is possible to recognise common features between wineries in British Columbia and Ontario. This underlines the actions undertaken by government to leverage favourable conditions with respect to the institutional framework supporting the development of the wine industry. While in contrast, the Quebec government's absence of strategy and strict regulations might be accountable to the lack of support infrastructure as well as to the infancy stage of development of the industry.

Third, the very small proportion of firms engaging in collaboration with HEIs as well as the little importance of these actors as knowledge sources stress the importance of leveraging the research system of the Canadian wine industry. Since the industry is likely to have a relatively low knowledge base, we can suggest that the overall industry would benefit from improved knowledge pipelines diffusing knowledge from HEIs.

8.6 Further research

The results of this thesis also underline some research challenges. First, there is a considerable gap in the literature on innovation investigating emerging wine-producing countries, such as Canada. Since the innovation pattern of the Canada wine industry does not appear to fit with well-established wine producing countries, it would be of a particular relevance to verify whether it would be consistent with other wine industries in comparable developmental stages.

Second, building on the findings regarding the small proportion of collaborations with HEIs, we may suggest investigating alternative scientific knowledge providers. Given the emergent developmental stages of the Canadian wine industry, scientific knowledge is beneficial to leverage the industry's knowledge base. Maybe there are other organisations within the industry diffusing scientific knowledge. Hence, further empirical evidence is necessary to fully understand the role, mission, and reach of the main support organisations of the Canadian wine industry.

Finally, while the present results are based on data considering only one time period, another research challenge would involve investigating the evolution of the Canadian wine industry using a longitudinal research design. This would be of particular importance considering the time lag required to develop product and process innovations within the wine industry.

REFERENCES

Alonso, A. D. (2011). "Standing alone you can't win anything": The importance of collaborative relationships for wineries producing muscadine wines. *Journal of Wine Research, 22*(1), 43-55.

Acs, Z.J., Fitz Roy, F.R., & Smith, I. (1999). High technology employment, wages and university R&D spillovers: Evidence from U.S. cities,*Economcs of Innovation and New Technology*, 2(8), 57-78.

Acs, Z.J. (2009). Jaffe-Feldman-Varga: The search for knowledge spillovers, chap. 2. in Universities, knowledge transfer and regional development, ed. A. Varga, 36–56. Cheltenham: Edward Elgar

Agriculture and Agri Food Canada. (2010). The Canadian Wine Products Industry NAICS 31213 Wine 1996-2007. Retrieved March 15, 2012, from http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1236005357888&lang=eng

Appold, S.J. (1995). Agglomeration, interorganizational networks, and competitive performance in the US metalworking sector. *Economic Geography, 71*(1), 27-54.

Asheim, B.T., & Coenen, L. (2006). Contextualising regional innovation systems in a globalising learning economy: On knowledge bases and institutional frameworks. *Journal of Technology Transfer, 31*(1), 163-173.

Asheim, B.T., Isaksen, A., Nauwelaers, C. & Tötdling, F. (2003). Regional innovation policy for small medium enterprises. Cheltenham, UK and Lyme, US : Edward Elgar

Asheim, B.T.,&Gertler, M.S., (2005). Regional innovation systems and the geographical foundations of innovation. In Fagerberg, J., Mowery, D. and R. Nelson,

Asheim, B.T., Smith. L. H., & Oughton. C. (2011). Regional Innovation Systems: Theory, Empirics and Policy.*Regional Studies,*45(7), 875–891.

Association des Vignerons du Quebec. (2012). Association des Vignerons du Quebec, Retrieved April 16, 2012, from http://www.vignerons-du-quebec.com/

Audretsch, D.B. (1998). Agglomeration and the location of innovative activity. *Oxford Review of Economic Policy*,(14) 18–29.

Aylward, D.K. (2002). Diffusion of R and D within the australian wine industry. *Prometheus, 20*(4), 351-366.

Aylward, D. (2004). Innovation-export linkages within different cluster models: A case study from the Australian wine industry. *Prometheus, 22*(4), 423-437.

Aylward, D. (2005). Global Landscapes: A Speculative Assessment of Emerging Organisational Structures within the International Wine Industry. *Prometheus: Critical Studies in Innovation*23(4): 421-436.

Aylward, D. (2006). Global pipelines: Profiling successful SME exporters within the Australian wine industry. *International Journal of Technology, Policy and Management, 6*(1), 49-65.

Aylward, D. (2007). Fault Lines: Emerging domains of inertia within the Australian wine industry, *Prometheus*, 25 (1), 85-98.

Aylward, D., & Turpin, T. (2003). New wine in old bottles: a case study of innovation territories in 'new world' wine production'. *International Journal of Innovation Management, 7*(4), 501-525.

Baba, Y., Shichijo N., & Sedita. S.R. (2009). How do collaborations with universities affect firms' innovative performance? The role of "Pasteur scientists" in the advanced materials field. *Research Policy*, 38(5), 756-764.

Balasubramanian. N.,& Lee , J., (2008). Firm age and innovation, *Industrial and Corporate Change*, 17, (5), 1019–1047.

Baldwin, J.R. & P. Hanel. 2003. Innovation and Knowledge Creation in an Open Economy. Cambridge: Cambridge University Press

Bathelt, H., Malmberg, A., & Maskell, P. (2004). Clusters and knowledge: Local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography, 28*(1), 31-56.

Barber, N., Taylor, D. C., & Deale, C. S. (2010). Wine tourism, environmental concerns, and purchase intention. *Journal of Travel and Tourism Marketing, 27*(2), 146-165.

Bell, M., & Giuliani, E. (2007). Catching up in the global wine industry: innovation systems, cluster knowledge networks and firm-level capabilities in Italy and Chile. *International Journal of Technology and Globalisation, 3*, 197-223.

Belussi, F., Sammarra, A., &Sedina. S.R. (2010). Learning at the boundaries in an "Open Regional Innovation System": A focus on firms' innovation strategies in the Emilia Romagna life science industry. *Research Policy,* 39(6),710-721.

Benneworth, P., & Charles, D. (2005) University spin- off policies and economic development in less successful regions: learning from two decades of policy practice. *European Planning Studies*, (13) 537–557.

Becheikh, N., Landry, R., & Amara, N. (2006). Lessons from innovation empirical studies in the manufacturing sector: A systematic review of the literature from 1993-2003. *Technovation, 26*(5-6), 644-664.

Berglund, D., & Clarke, M. (2000). *Using research and development to grow state economies*. Washington, DC: National Governors' Association.

Beverland, M., & Lockshin, L.S. (2001). Organizational life cycles in small New Zealand wineries.*Journal of Small Business Management*, 39(4), 354–362.

Bienkowska, D., Lundmark, M., & Malmberg, A. (2011). Brain circulation and flexible adjustment: Labour mobility as A cluster advantage. *Geografiska Annaler, Series B: Human Geography, 93*(1), 21-39.

Boschma, R. A. & Frenken. K. (2005). Why is economic geography not an evolutionary science? Towards an evolutionary economic geography. *Journal of Economic Geography,*6(3), 273-302.

Breschi, S., & Lissoni, F. (2001). Knowledge spillovers and local innovation systems: A critical survey. *Industrial and Corporate Change, 10*(4), 975-1005.

British Columbia Ministry of Agriculture, Food and Fisheries. (2005). New British Columbia Wine Authority to focus on Quality, Retrieved April 6, 2010, from http://www2.news.gov.bc.ca/archive/2001-2005/2005AGF0005-000177.htm

British Columbia Wine Institute. (2009). BCWI Annual Report 2008-2009, 4-13.

Cáceres, R., Guzmán, J., & Rekowski, M. (2011). Firms as source of variety in innovation: Influence of size and sector. *International Entrepreneurship and Management Journal, 7*(3), 357-372.

Cadot,Y., Caillé, S., Thiollet-Scholtus, M., Samson, A. Barbeau, G.& Cheynier, V. (2012). Characterisation of typicality for wines related to terroir by conceptual and by perceptual representations. An application to red wines from the Loire Valley, *Food Quality and Preference*, (24), 48–58.

Casadesus-Masanell, R., & Ricart, J. E. (2010). From strategy to business models and onto tactics. *Long Range Planning, 43*(2-3), 195-215.

Centonze, A. L. (2010). Transitional cluster development: A case study from the new york wine industry. *Economic Development Quarterly, 24*(3), 251-260.

Chesbrough, H.W. (2003). Open Innovation: The New Imperative for Creating and Profiting from Technology, Harvard Business School Press; Harvard.

Chesbrough, H.W. (2006). Open Business Models, Harvard Business Press, Cambridge, Massachusetts.

Clemente-Ricolfe, J., Escribá-Pérez, C., Rodriguez-Barrio, J., & Buitrago-Vera, J. (2012). The potential wine tourist market: The case of valencia (spain). *Journal of Wine Research, 23*(2), 185-202.

Cohen, W. M. (1995). Empirical Studies of Innovative Activity, in P. Stoneman., ed., Handbook of the Economic of Innovation and Technological Change. Oxford: Blackwell.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A new perspective on learning and innovation. *Administrative Science Quarterly, 35*, 128-152.

Cooke, P., Boekholt, P.,& Tödtling, F. (2000). The governance of innovation in Europe. London: Pinter.

Cooke, P., Heidenreich, M., & Braczyk, H.-J. (2004). Regional Innovation Systems - The role of governance in a globalized world (Second Edition): Routledge.

Cooke, P., &Leydesdorff,l.(2006). Regional Development in the Knowledge-Based Economy: The Construction of Advantage,*The Journal of Technology Transfer*, 31(1), 5-15.

Cooke, P., Uranga M. G., &Etxebarria, G. (1997). Regional innovation systems: Institutional and organisational dimensions, *Research Policy*, 26(5), 475–491.

Corpataux, J., & Crevoisier, O. (2007). Economic theories and spatial transformations clarifying the space-time premises and outcomes of economic theories. *Journal of Economic Geography, 7*(3), 285-30.

Corsino, M., Espa, G., & Micciolo, R. (2011). R&D, firm size and incremental product innovation. *Economics of Innovation and New Technology, 20*(5), 423-443.

Cusmano, L., Morrison, A., & Rabellotti, R. (2010). Catching up trajectories in the wine sector: A comparative study of chile, italy, and south africa. *World Development, 38*(11), 1588-1602.

Dahlander, L., & Gann, D. M. (2010). How open is innovation? *Research Policy, 39*(6), 699-709.

Dana, L.P., & Winstone, K.E. (2008). Wine cluster formation in New Zealand: operation, evolution and impact*, International Journal of Food Science and Technology*, 43 (12), 2177-2190.

Danneels, E. (2002). The dynamics of product innovation and firm competences. *Strategic Management Journal, 23*(12), 1095-112.

Dawson, H., Holmes, M., Jacobs, H., & Wade, R. I. (2011). Wine tourism: Winery visitation in the wine appellations of ontario. *Journal of Vacation Marketing, 17*(3), 237-246.

de la Mothe, J.,&Paquet, G. (1998). Local and Regional Systems of Innovation as Learning Socio-economies, in de la Mothe, J. and Paquet, G. (eds.), *Local and Regional Systems of Innovation*. Boston, Dordrecht, London: Kluwer Academic Publishers, 1-16.

Departement of Justice Canada, (2012). Constitution Act 1867 to 1982, Retrieved September 12, 2012, from http://laws-lois.justice.gc.ca/eng/Const/index.html

D'Este, P., & Iammarino, S. (2010). The spatial profile of university-business research partnerships. *Papers in Regional Science, 89*(2), 335-350.

Diffenbaugh, N. S., White, M. A., Jones, G. V., & Ashfaq, M. (2011). Climate adaptation wedges: A case study of premium wine in the western united states. *Environmental Research Letters, 6*(2), 1-11.

Ditter, J.G., (2005). Cluster et terroirs: les systèmes productifs localisés dans la filière vitivinicole. *Reflets et Perspectives*, (4), 35-51.

Doloreux, D. (2002). What we should know about regional systems of innovation. *Technology in Society, 24*(3), 243-263.

Doloreux, D. (2004). Regional innovation systems in Canada: a comparative study. *Regional Studies, 38*(5), 479-492.

Doloreux, D., & Dionne, S. (2008). Is regional innovation system development possible in peripheral regions? Some evidence from the case of Pocatière, Canada. *Entrepreneurship and Regional Development,* (20) 259-283.

Doloreux, D., & Lord Tarte, E. (2012a). Context and differentiation: development of the wine industry in three Canadian regions. *Social Science Journal,* Forthcoming.

Doloreux, D.,& Lord Tarte, E. (2012b). Innovation dynamics and the location of the wine industry in Canada. *European Planning Studies*, Forthcoming.

Doloreux, D.,& Lord Tarte, E. (2012c). The organisation of innovation in the wine industry: open innovation, external sources of knowledge and proximity.*European Journal of Innovation Management*, Submitted.

Doloreux, D., & Mattson, H. (2008). To What Extent do Sectors "Socialize" Innovation Differently? Mapping Cooperative Linkages in Knowledge-Intensive Industries in the Ottawa Region.*Industry and Innovation*, 15(4), 351-370.

Doloreux, D., & Shearmur, R. (2012). Collaboration, information and the geography of innovation in knowledge intensive business services. *Journal of Economic Geography, 12*(1), 79-105.

Dosi, G. (1988). The nature of the innovative process. In: Dosi G, et al. (eds) Technical change and economic theory. Pinter, London

Edquist, C. (2005). Systems of innovation: Perspectives and challenges. In J. Fagerberg, D. C. Mowery & R. R. Nelson (Eds.), The Oxford handbook of innovation, Oxford: Oxford University Press, 181-208.

Feldman, M.P. (2000). Location and Innovation: The New Economic Geography of Innovation, Spillovers, and Agglomeration" in G. Clark, M. Feldman and M. Gertler, eds. Oxford Handbook of Economic Geography, Oxford: Oxford University Press

Fensterseifer, J.E. (2007). The Emerging Brazilian Wine Industry: Challenges and prospects for the Serra Gaúcha Wine Cluster.*International Journal of Wine Business Research*, 19 (3): 187-206.

Fitjar, R.D.,&Rodríguez-Pose, A. (2011). Innovating in the Periphery: Firms, Values and Innovation in Southwest Norway.*European Planning Studies*, 19(4), 555-574

Forsman, H. (2011). Innovation Capacity and Innovation Development in Small Enterprises. A comparison between the Manufacturing and Service Sectors. *Research Policy*, 40(5), 739-750

Freel, M. (2000). Do small innovating firms outperform non-innovators? *Small Business Economics, 14*(3), 195-210.

Freel, M. (2003). Sectoral patterns of small firm innovation, networking and proximity. *Research Policy*,32(5), 751-770.

Freeman, C. (1995). The National Innovation Systems in historical perspective.*Cambridge Journal of Economics*,19(1), 5-24.

Fritsch, M., & Schroeter, A.(2011). Why does the effect of new business formation differ across regions?*Small Business Economics*, 36(4), 383-400.

Gade, D. (2004). Tradition, Territory and Terroir in French Viticulture: Cassis, France and Appellation Contrôlée. *Annals of Association of American Geograhers*, 94 (4), 848-867.

Gilbert, B. A., McDougall, P. P., & Audretsch, D. B. (2008). Clusters, knowledge spillovers and new venture performance: An empirical examination. *Journal of Business Venturing, 23*(4), 405-422.

Gilinsky,A., Santini, C., Lazzeretti, L., &Eyler, R. (2008). Desperately seeking serendipity: Exploring the impact of country location on innovation in the wine industry, *International Journal of Wine Business Research*, 20(4), 302 – 32.

Giuliani, E. (2007). The selective nature of knowledge networks in clusters: Evidence from the wine industry. *Journal of Economic Geography, 7*(2), 139-168.

Giuliani, E. (2011). Role of technological gatekeepers in the growth of industrial clusters: Evidence from chile. *Regional Studies, 45*(10), 1329-1348.

Giuliani, E.,&Arza, V. (2009). What drives the formation of 'valuable' university-industry linkages? Insights from the wine industry.*Research Policy*, 38 (6), 906-921.

Giuliani, E.,& Bell, M. (2005). The micro-determinants of meso-level learning and innovation: evidence from a Chilean wine cluster.*Research Policy,* 34 (1) 47-68.

Godin, B. (2006). The linear model of innovation: The historical construction of an analytical framework. *Science Technology and Human Values, 31*(6), 639-667.

Goulet, E., &Morlat, R., (2011). The use of surveys among wine growers in vineyards of the middle-Loire Valley (France), in relation to terroir studies. *Land Use Policy*, 28, 770-782

Greenspan, P., Bauer, J.D., Pollock, S.H., Gangemi J.D., Mayer, E.P., Ghaffar, A.,Hargrove, J.L., & Hartle, D.K. (2005). Antiinflammatory properties of the muscadine grape (Vitis rotundifolia).*Journal of Agricultural and Food Chemistry*, 53, 8481–8484.

Guillaume, R., & Doloreux, D. (2011). Production systems and innovation in 'satellite' regions: Lessons from a comparison between mechanic valley (france) and beauce (québec). *International Journal of Urban and Regional Research, 35*(6), 1133-1153.

Gundlach, H., & Neville, B. (2012). Authenticity: Further theoretical and practical development. *Journal of Brand Management, 19*(6), 484-499.

Guthey, G. T. (2008). Agro-industrial conventions: some evidence from northern California's wine industry.*Geographical Journal,* 174(2), 138–148

Hannan, M. T., & Freeman, J. (1984).Structural inertia and organizational change.*American Journal of Sociology*, 49, 149–164.

Hassink, R. (2005). How to unlock regional economies from path dependency? From learning region to learning cluster. *European Planning Studies,* 13(4), 521–535

Heidenreich, M. (2009). Innovation patterns and location of european low-and medium-technology industries. *Research Policy, 38*(3), 483-494.

Holbrook, A., & Wolfe, D.A. (2005). The innovation systems research network: a Canadian experiment in knowledge management. *Science and public policy, 32*(2), 109-118.

Huizingh, E. K. R. E. (2011). Open innovation: State of the art and future perspectives. *Technovation, 31*(1), 2-9.

Hussain, M., Cholette, Su.,& Castaldi, R. (2007). Determinants of wine consumption of US consumers: an econometric analysis.*International Journal of Wine Business Research*, 19(1), 49-62.

Iammarino, S., & McCann, P. (2006).The structure and evolution of industrial clusters: transactions, technology and knowledge spillovers.*Research policy*, 35(7), 1018-1036.

Industry Canada. (2010). Canadian Industry Statistics (CIS), Definition Wineries (NAICS 31213). Retrieved July 30, 2010, from http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic31213defe.html

Isaksen, A. (2005). Regional clusters building on local and non-local relationships: a european comparison. In: A. Lagendijk et O. Païvi (Eds.), Proximity, distance and diversity. Ashgate, Aldershot, 129-152.

Isaksen, A. (2009). Innovation dynamics of global competitive regional clusters: the case of the Norwegian centres of expertise.*Regional Studies*, 43(9), 1155-1166.

Jaffe, A.B., Trajtenberg, M., & Henderson R. (1993).Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations. *The Quarterly Journal of Economics*, 108(3), 577-59.

Jick, T.D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly*, 24, 602-611.

Jiménez-Barrionuevo, M. M., García-Morales, V. J., & Molina, L. M. (2011). Validation of an instrument to measure absorptive capacity. *Technovation, 31*(5-6), 190-202

Jones, N. K. (2012). The influence of recent climate change on wine regions in quebec, canada. *Journal of Wine Research, 23*(2), 103-113

Huber, F. (2011).Do clusters really matter for innovation practices in Information Technology? Questioning the significance of technological knowledge spillovers. *Journal of Economic Geography,* 12, 107–126.

Kaufmann, A., & Tödtling, F. (2001). Science-industry interaction in the process of innovation: The importance of boundary-crossing between systems. *Research Policy, 30*(5), 791-804

Kline, S.J. & Rosenberg N. (1986). An overview of innovation. In R. Landau & N. Rosenberg (eds.), *The Positive Sum Strategy: Harnessing Technology for Economic Growth*. Washington, D.C.: National Academy Press, pp. 275–305.

Kostopoulos, K., Papalexandris, A., Papachroni, M., & Ioannou, G. (2011). Absorptive capacity, innovation, and financial performance. *Journal of Business Research, 64*(12), 1335-1343.

Kotha, R., Zheng, Y., & George, G. (2011). Entry into new niches: The effects of firm age and the expansion of technological capabilities on innovative output and impact. *Strategic Management Journal, 32*(9), 1011-1024.

Krugman, P. (1991a). Increasing returns and economic geography. *Journal of Political Economy, (*99) 483–499.

Krugman, P. (1991b).*Geography and trade,*MIT Press, Cambridge MA

Kukalis, S. (2010). Agglomeration economies and firm performance: The case of industry clusters. *Journal of Management, 36*(2), 453-481.

Lagendijk, A., &Oinas. P. (2005). Proximity, external relations, and local economic development, in Lagendijk A. and Oinas, P. (Eds) Proximity, distance and diversity. Issues on economic interaction and local development, 3-22. Ashgate, Farnha.

Lattin, J., Carroll, J. D., & Green, P. E. (2003). *Analyzing Multivariate Data*. California: Thomson Learning.

Laursen, K.,& Salter A.J.(2006). Open for Innovation: The Role of Openness in Explaining Innovation Performance Among U.K. Manufacturing Firms.*Strategic Management Journal,* 27, 131-150.

Laursen, K., Reichstein, T., & Salter, A. (2011). Exploring the effect of geographical proximity and university quality on university-industry collaboration in the united kingdom. *Regional Studies, 45*(4), 507-523.

Lazzarotti, V., & Manzini, R. (2009). Different modes of open innovation: A theoretical framework and an empirical study. *International Journal of Innovation Management, 13*(4), 615-636.

Leamer, E, &Storper, M. The Geography of the Internet Age. (2001). Working Paper 8450, National Bureau of Economic Research, Cambridge, MA

Lee, Y.S. (2000). The sustainability of university-industry research collaboration: An empirical assessment.*Journal of Technology Transfer,* 25(2), 111-133.

Lendel, I. (2010). The impact of research universities on regional economies: The concept of university products. *Economic Development Quarterly, 24*(3), 210-230.

Lester, R. (2005). Universities, innovation, and the competitiveness of local economies: Summary report from the local innovation project(MIT-IPC-05–010). Cambridge: MIT, Industrial Performance Center.

Lhuillery, S., & Pfister, E. (2009). R&D cooperation and failures in innovation projects: Empirical evidence from French CIS data.*Research Policy*,38(1), 45-57.

Lockett, A., Siegel, D., Wright, M., & Ensley, M.D.(2005). The creation of spin-off firms at public research institutions: Managerial and policy implications. *Research Policy*, 34, 981–93.

Lundvall, B-A. (1992). National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning. London: Pinter.

Lundvall, B-A. (2007). National Innovation Systems - Analytical Concept and Development Tool.*Industry & Innovation*, 14(1), 95-119.

Luo, Y.(1997). Partner selection and venturing success: the case of Joint Ventures with firms in the People's Republic of China. *Organization Science,* 8(6), 648–662.

Madill, J., Riding, A., & Haines, G.H. (2008). Strategic Dilemmas of a Small Market Player: The Canadian Wine Industry. In Nigam, D. and Jha, J. (Eds.). Wine Industry-Global and Indian Scenarios. Kolkata, India: ICFAI Research Centre.

Malerba, F. (2005). Sectoral systems: How and why innovation differs across sectors In J. Fagerberg, D. C. Mowery and R. R. Nelson (Eds.), The Oxford handbook of innovation (pp. 381-405). Oxford: Oxford University Press.

Malerba, F. (2007). Innovation and the dynamics and evolution of industries: Progress and challenges. *International Journal of Industrial Organization, 25*(4), 675-699.

Malheiro, A.C., Santos, J.A., Fraga, H., & Pinto, J.G. (2010). Climate change scenarios applied to viticultural zoning in europe. *Climate Research, 43*(3), 163-177.

Malmberg, A., & Power, D. (2005). On the role of global demand in local innovation processes. In G. Fuchs & P. Shapira (Eds.), Rethinking regional innovation and change; path dependency or regional breakthrough. New York: Springer.

Martin, R.,&Sunley, P. (2006). Path dependence and regional economic evolution. Journal of Economic Geography, 6(4), 395–437.

Maskell P., &Malmberg A. (1999). Localised learning and industrial competitiveness. Cambridge Journal of Economics, 23(2), 167–185.

Maskell, P. (2000). Social capital and competitiveness. Chapter 6 in: Baron, S., Field, J. and Schuller, T., (Eds.) Social Capital. Critical Perspectives. Oxford: Oxford University Press.

McCann, P. (2007). Sketching out a model of innovation, face-to-face interaction and economic geography. *Spatial Economic Analysis* 2(2), 117–13.

McCann, B.T., & Folta, T. B. (2011). Performance differentials within geographic clusters. *Journal of Business Venturing, 26*(1), 104-123.

McDermott, G. A. (2007). The politics of institutional renovation and economic upgrading: Recombining the vines that bind in argentina. *Politics and Society, 35*(1), 103-144

Michie, J., &Sheehan, M., (2003). Labour market deregulation, 'flexibility' and innovation. *Cambridge Journal of Economics*, 27(1), 123–14.

Minniti, A. (2011). Knowledge appropriability, firm size, and growth. *Journal of Macroeconomics, 33*(3), 438-454.

Moodie, G., (2002). Identifying Vocational Education and Training, *Journal of Vocational Education and Training,* 54(2), 251-267.

Morrison, A., & Rabellotti, R. (2009). Knowledge and Information Networks in an Italian Wine Cluster. *European Planning Studies, 17*(7), 983-1006.

Mueller, R., &Sumner, D. (2006). Clusters of Grapes and Wine, *Third International Wine Business Research Conference, Montpellier, France*.

Nauwelaers, C., &Wintjes, R. (2003). Towards a New Paradigma for Innovation Policy?, in: B. Asheim, A. Isaksen, C. Nauwelaers and F. Tödtling (Eds.), Regional Innovation Policy for Small-Medium Enterprises, Edward Elgar, Cheltenham, pp.193-22.

Niosi, J. (2005). *Canada's regional innovation systems: the science-based industries*. Montreal & Kingston: McGill-Queen's University Press.

OECD, (2002). Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development, OECD, Paris, www.oecd.org/sti/frascatimanual.

OECD, (1997), Oslo Manual, Proposed Guidelines for Collecting and Interpreting Technological Innovation Data, Organisation for Economic Co–Operation and Development / Statistical Office of the European Communities, Paris.

OECD, (2007). Manuel d'Oslo: Principes directeurs proposés pour le recueil et l'interprétation des données sur l'innovation technologique, Paris : 2ième édition.

OECD, (2008). Open Innovation in Global Networks, Paris.

OIV, (2010). Résolution OIV/Viti 333/2010. In AG OIV 25/06/2010 Tbilissi (Georgie)

Parliament of Canada, (2012). Bill C-311. Retrieved September 12, 2012 from http://www.parl.gc.ca/HousePublications/Publication.aspx?Docid=4501250

Polèse, M. (2005). Cities and national economic growth: A reappraisal. *Urban Studies, 42*(8), 1429-1451.

Petroni, A., &Panciroli, B., (2002). Innovation as a determinant of suppliers' roles and performances: an empirical study in the food machinery industry. *European Journal of Purchasing & Supply Management,* 8(3), 135–149.

Pirnay, F., Surlemont, B., & Nlemvo, F. (2003). Toward a typology of university spin-offs. *Small Business Economics,* 21, 355–369.

Pittaway, L., Robertson, M., Munir, K., Denyer, D., & Neely, A. (2004). Networking and innovation: A systematic review of the evidence. *International Journal of Management Reviews, 5-6*(3-4), 137-168.

Porter, M. E. (2000). Locations, clusters and company strategy. In G. L. Clark, M. Feldman, and M. Gertler (eds) Oxford Handbook of Economic Geography. Oxford: Oxford University Press: 253–274.

Porter, M.E. (2003). The economic performance of regions. *Regional Studies,* 37(6), 549-578.

Power, D., & Malmberg, A. (2008). The contribution of universities to innovation and economic development: In what sense a regional problem. *Cambridge Journal of Regions, Economy and Society, 1*(2), 233-245.

Puuka, J. (2008). Higher education institutions and regional mission: Lessons learnt from the OECD review project. *Higher Education Policy,* 20, 1–2.

Ramos-Vielba, I., Fernández-Esquinas, M., & Espinosa-de-los-Monteros, E. (2010). Measuring university-industry collaboration in a regional innovation system.*Scientometrics, 84*(3), 649-667.

Ray, C. (1995). Practical considerations in the use of simultaneous inference for multiple tests. *Animal Behaviour,* 49(2), Feb 1995, 524-527

Reuber, A. R., & Fischer, E. (1999). Understanding the Consequences of Founders' Experience.*Journal of Small Business Management,*37(2), 30–45.

Rosenfeld, S. A. (2003). Expanding opportunities: Cluster strategies that reach more people and more places. *European Planning Studies, 11*(4), 359-378.

Ryans, A., More, R., Barclay, D., &Deutscher, T. (2000). Winning Marketing Leadership Strategic Market Planning for Technology-Driven Businesses (Toronto: John Wiley).

Schumpeter, J.A., (1934). The Theory of Economic Development. Harvard University Press, Cambridge, MA.

Schumpeter, J.A., (1942). Capitalism, Socialism and Democracy. Harper, New York.

Shearmur, R. (2011). Innovation, regions and proximity: From neo-regionalism to spatial analysis. [Innovation, regions et proximité: Du néorégionalisme à l'analyse spatiale] *Regional Studies, 45*(9), 1225-1243.

Shearmur, R., & Doloreux. D. (2009). Place, space and distance: Towards a geography of knowledge intensive business services innovation. *Industry and Innovation*16(1), 79–102.

Shearmur, R., &Polèse, M. (2003). Économies d'agglomération et liens inter-entreprises dans un cadre métropolitain: la cas de Québec. *La Communauté métropolitaine de Québec*, 1-42.

Schmidt, T., & Rammer, C. (2007). Non-technological and technological innovation: strange bedfel-lows?, ZEW Discussion Paper 07-052, Mannheim: Centre for European EconomicResearch.

Simmie, J. (2003). Innovation and Urban Regions and National and International Nodes for the Transfer and Sharing of Knowledge, *Regional Studies*, 37,607-662.

Simmie, J. (2005). Innovation and space: A critical review of the literature. *Regional Studies, 39*(6), 789-804.

Smith, K., & Marsh, I. (2007). Wine and economic development: Technological and corporate change in the australian wine industry. *International Journal of Technology and Globalisation, 3*(2-3), 224-245.

Société des alcools du Quebec, (2010). Rapport Annuel – finance, Retrieved April 13, 2010, from http://www.saq.com/wcsstore/saqcom/images_produits/divers/Rapport_Annuel/SAQ_Finances.pdf

Sørensen, J.B., &Stuart, T.E., (2000). Aging, obsolescence, and organizational innovation. *Administrative Science Quarterly,* 45(1), 81–112.

Stock, G.N., Greis, N.P., &Fischer, W.A. (2002). Firm size and dynamic technological innovation. *Technovation,* 22, 537–549.

Taplin, I. M., & Breckenridge, R. S. (2008). Large firms, legitimation and industry identity: The growth of the North Carolina wine industry. *The Social Science Journal, 45*(2), 352-360.

Taplin, I. M. (2010). From co-operation to competition: market transformation among elite Napa Valley wine producers.*International Journal of Wine Business Research*, 22(1), 6-26.

Taplin, I. M. (2011). Network structure and knowledge transfer in cluster evolution: The transformation of the napa valley wine region. *International Journal of Organizational Analysis, 19*(2), 127-145.

Teece, D. J., Pisano, G., &Shuen,A. (1997). Dynamic Capabilities and Strategic Management.*Strategic Management Journal,*18(7), 509–533.

Tether, B. S. (2002). Who co-operates for innovation, and why an empirical analysis. *Research Policy, 31*(6), 947-967.

Thach, L. (2012). Time for wine? identifying differences in wine-drinking occasions for male and female wine consumers. *Journal of Wine Research, 23*(2), 134-154.

Thornhill, S., Gellatly, G., & Riding, A. (2004). Growth history, knowledge intensity and capital structure in small firms. *Venture Capital, 6*(1), 73-89.

Tiffin, S., & Kunc, M. (2011). Measuring the roles universities play in regional innovation systems: A comparative study between chilean and canadian natural resource-based regions. *Science and Public Policy, 38*(1), 55-66.

Tödtling, F., & Trippl, M. (2005). One size fits all?: Towards a differentiated regional innovation policy approach. *Research Policy, 34*(8), 1203-1219.

Tödtling, F., Lehner, P., & Kaufmann, A. (2009). Do different types of innovation rely on specific kinds of knowledge interactions? *Technovation, 29*(1), 59-71.

Tödtling, F., Lehner, P., & Trippl, M. (2006). Innovation in knowledge intensive industries: The nature and geography of knowledge links. *European Planning Studies, 14*(8), 1035-1058.

Tödtling, F., Lengauer, L., & Höglinger, C. (2011). Knowledge sourcing and innovation in "thick" and "thin" regional innovation systems-comparing ICT firms in two austrian regions. *European Planning Studies, 19*(7), 1245-1276.

Torre, A. (2009). Back to the concept of geographical proximity. [Retour sur la notion de proximité géographique] *Geographie Economie Societe, 11*(1), 63-75.

Trott, P., & Hartmann, D. (2009). Why 'open innovation' is old wine in new bottles. *International Journal of Innovation Management, 13*(4), 715-736.

Uyarra, E. (2009). What is evolutionary about 'regional systems of innovation'? Implications for regional policy. *Journal of Evolutionary Economics, 20*(1), 115-137.

Van Leeuwen, C., & Seguin, G. (2006). The concept of terroir in viticulture. *Journal of Wine Research, 17*(1), 1-10.

Velluzzi, N. D. (2010). Community colleges, clusters, and competition: A case from Washington wine country. *Regional Studies,*44(2), 201-214.

Vintners Quality Alliance Ontario. (2009). VQA Annual Report 2009, 6-24.

West, G. P., &Noel, T. W. (2009). The Impact of Knowledge Resources on New Venture Performance.*Journal of Small Business Management,*47(1), 1–22.

Wines of Ontario, (2009). *Year review 2008-2009,* Wine Council of Ontario. Retrieved March 15, 2010, from http://winesofontario.org/PDFs/WCOYearReview08-09.pdf

Withers, M. C., Drnevich, P. L., & Marino, L. (2011). Doing more with less: The disordinal implications of firm age for leveraging capabilities for innovation activity. *Journal of Small Business Management, 49*(4), 515-536.

Wolfe, D. (2009). Introduction: Embedded Clusters in a Global Economy.*European Planning Studies*, 17(2),179-87.

Yin, R. (1984). Case study research: Design and methods (1st ed.). Beverly Hills, CA: Sage Publishing

Zahra, S.A., & George, G. (2002). Absorptive capacity: a review, reconceptualization, and extension. *Academy of Management Review,* 27(2), 185-203.

Zahra, S.A., &Hayton, J.C., (2008). The effect of international venturing on firm performance: the moderating influence of absorptive capacity. *Journal of Business Venturing,* 23(2), 195–220.

Zhang, J. (2009). The performance of university spin-offs: An exploratory analysis using venture capital data. *Journal of Technology Transfer, 34*(3), 255-285.

APPENDIX A: SURVEY ON THE WINE INDUSTRY IN CANADA

1. Business strategies and competitiveness

1.1 Please rate the importance of the following business strategies that your establishment pursue to remain competitive vis-*à-vis* other firms (on a scale from 1 to 5 where 1 is not important at all and 5 crucial).

	Not important (1)	Moderately important (2)	Important (3)	Very important (4)	Crucial (5)
a. Product quality	1	2	3	4	5
b. Cost saving	1	2	3	4	5
c. Access to supplies	1	2	3	4	5
d. Market differentiation (types and portfolio of wines)	1	2	3	4	5
e. Promotion of improvements in processes and equipment	1	2	3	4	5
f. Introduction of product innovations	1	2	3	4	5
g. Investment in education and training	1	2	3	4	5
h. Business diversification and alternatives revenues streams (restaurants, agro-tourism, etc.)	1	2	3	4	5
i. Respond to environmental values	1	2	3	4	5

1.2 Please rate the importance of the following challenges that affect your growth in terms of volume and price (on a scale from 1 to 5 where 1 is not important at all and 5 crucial).

	Not important (1)	Moderately important (2)	Important (3)	Very important (4)	Crucial (5)
a. Developing domestic markets	1	2	3	4	5
b. Developing export markets	1	2	3	4	5
c. Developing niche or specialized markets	1	2	3	4	5
d. Association with a distributor	1	2	3	4	5
e. Association with another winery	1	2	3	4	5
f. Brand management in the target market	1	2	3	4	5
g. Development of new wine types	1	2	3	4	5
h. Improvement of wine quality	1	2	3	4	5
i. Ability to comply with environmental standards and regulations	1	2	3	4	5
j. Implementing new information and communication technologies	1	2	3	4	5

1.3 Please indicate whether your establishment had pursued the following activities in the last three years, 2006-2009 (Yes or No)

1.3.1 Development of new varietals or assemblages (Yes/No)

1.3.2 Improvement of wine quality (Yes/No)

1.3.3 Reduction in production costs (Yes/No)

1.3.4 Changes in the relation with suppliers (Yes/No)

1.3.5 Adoption of new wine making technology (Yes/No)

1.3.6 Increase in the delivery agility through changes in the logistic system (Yes/No)

2. Innovation activities and innovation outputs

2.1 During the last three years, 2006 to 2009, did your establishment engage in the following activities?

2.1.1 Development of new products and processes (internal R&D) (Yes/No)

2.1.2 External R&D (Yes/No)

2.1.3 Acquisition of machinery, equipment and software (Yes/No)

2.1.4 Acquisition of other external knowledge (Yes/No)

2.1.5 Training (Yes/No)

2.1.6 Activities for the market introduction of new or improved products (Yes/No)

2.1.7 Activities undertaken to ensure the commercial success of your new or significantly improved products (Yes/No)

2.2 During the last three years, 2006-2009, did your establishment introduce new or significantly improved products (yes/no)

2.2.1 If yes, were ANY of your new or significantly improved products (goods or services) introduced by your establishment:

a) A first for your firm

b) A first in Canada

c) A first in the world

2.3 During the last three years, 2006-2009, did your establishment introduce new or significantly improved processes (production process, distribution method, or support activity) (yes/no)

2.3.1 If yes, were ANY of your new or significantly improved processes introduced by your establishment:

a) A first for your firm

b) A first in Canada

c) A first in the world

2.4 During the last three years, 2006-2009, did your establishment introduced new or significantly improved growing techniques (mechanized viticulture, grape stocks, irrigation practices, etc.) (Yes or No)

2.4.1 If yes, were ANY of your new or significantly improved growing techniques introduced by your establishment:

a) A first for your firm

b) A first in Canada

c) A first in the world

2.5 During the last three years, 2006-2009, did your establishment introduce new or significantly improved production techniques (control of winemaking practices, methods of grape and wine analysis, etc.) (Yes or No)

2.5.1 If yes, were ANY of your new or significantly improved production techniques introduced by your establishment:

a) A first for your firm

b) A first in Canada

c) A first in the world

2.6 During the last three years, 2006-2009, did your establishment introduce new or significantly modified business strategies, including market development (new markets, new mission statements, channel distribution, etc.) (yes/no)

2.6.1 If yes, were ANY of your new or significantly modified business strategies introduced by your establishment:

a) A first for your firm

b) A first in Canada

c) A first in the world

2.7 During the last three years, 2006-2009, did your establishment introduce new or significantly modified managerial techniques (knowledge management practices) (yes/no)

2.7.1 If yes, were ANY of your new or significantly modified managerial techniques introducedby your establishment:

a) A first for your firm

b) A first in Canada

c) A first in the world

2.8 During the last three years, 2006-2009, did your establishment introduce new or significantly modified marketing strategies and concept processes (labels, brand; product positioning and profiling, etc.) (yes/no)

2.8.1 If yes, were ANY of your new or significantly modified marketing strategies introduced by your establishment:

a) A first for your firm

b) A first in Canada

c) A first in the world

3. 3. Collaboration

3.1 How important were the following actors as sources of information for innovation in the last 3 years? (on a scale from 1 to 5 where 1 is not important at all and 5 crucial)

	Not important (1)	Moderately important (2)	Important (3)	Very important (4)	Crucial (5)
a. Suppliers	1	2	3	4	5
b. Customers	1	2	3	4	5
c. Competitors or other firms in your sector	1	2	3	4	5
d. Business service companies	1	2	3	4	5
e. Universities	1	2	3	4	5
f. Colleges/technical institutes	1	2	3	4	5
g. Federal government agencies	1	2	3	4	5
h. Provincial government agencies	1	2	3	4	5
i. Industry associations	1	2	3	4	5
j. Conferences, trade fairs, exhibitions	1	2	3	4	5

3.2 Did your establishment co-operate with other businesses or organizations for innovation related activities during the last three year? (yes/no)

3.2.1 If yes, please indicate the types of co-operation partners and their geographical location during the last three years, 2006-2009

	Local/regional	National	USA	South America	Europe	Australasia	Other countries
a. Clients or customers							
b. Suppliers of equipment, material, components, or software							
c. Competitors or other firms in your sector							
d. Business service firms/consultants							
e. Universities							
f. Colleges/technical institutes							
g. Laboratories research institutes							
h. Industrial associations							

3.3 Please indicate which of the following reasons were important in determining the involvement of your establishment in co-operative arrangements (please tick all that apply)

	Yes	**No**
a. Sharing cost and risks associated with developing products		
b. Accessing research and development (R&D)		
c. Accessing critical expertise and knowledge		
d. Scaling up production processes		
e. Accessing new markets		
f. Accessing new distribution channels		
g. Sharing cost of developing products		
h. Increasing flexibility for production capacities		

3.4 What type of business and organization is your most important collaborator for product development?

a) Clients or customers
b) Suppliers of equipment, material, components, or software
c) Competitors or other firms in your sector
d) Business service firms/consultants
e) Universities
f) Colleges/technical institutes
g) Laboratories and research institutes
h) Industrial associations

3.5 Where was this partner located? City _____

3.6 What was the focus of your cooperative activities with this partner in the last 3 years, 2006-2009 (please tick all that apply)

	Yes	**No**
a. R&D, technological development		
b. Joint product development		
c. Joint development of new process		
d. Growing techniques improvement or development		
e. Production techniques improvement or development		
f. Marketing/exporting		
g. Training		
h. Financing		
i. Recruitment of specialists		

3.7 In the past three years, 2006-2009, how often, did you have contacts with your main collaborator

a) At least once a week

b) Twice a month

c) Once a month

d) Once every two months

e) Less than once every three months

3.8 Please identify the types of knowledge transferred with your most importantcollaborator (yes/no) (please tick all that apply)

	Yes	**No**
3.9.1. **Technological knowledge** (competences necessary to the process and execution of product and process development, and includes scientific knowledge as well as applied and experimental knowledge)		
3.9.2. **Managerial knowledge** (competences to efficiently and effectively coordinate and supervise resources and processes (e.g. business process re-engineering and total quality management)		
3.9.3. **Market knowledge** (organized and structured information on the markets and include competence centred on customers' characteristics, preferences and needs that firms are requested to satisfy.		

3.9 Did your establishment co-operate with universities/colleges and other higher education institutes (yes/no)

3.9.1 If yes, please indicate the importance of the following services and activities undertaken with universities, colleges and other higher education institutes (on a scale from 1 to 5 where 1 is not important at all and 5 crucial)

	Not important (1)	Moderately important (2)	Important (3)	Very important (4)	Crucial (5)
a. Use of students on work placement	1	2	3	4	5
b. Recruitment of post-graduates	1	2	3	4	5
c. Joint R&D projects with academic centers	1	2	3	4	5
d. Sharing facilities (equipment, premise, etc.)	1	2	3	4	5
e. Contracting out research and advice	1	2	3	4	5
f. Continuing education for your employees	1	2	3	4	5
g. Sharing employees with academic centers (combined part-time appointments)	1	2	3	4	5

4. R&D

4.1 Did your establishment engage in R&D activities in the past three years, 2006-2009 (Yes or No)

4.1.1 If yes, please estimate (at the best you can) the percentage of your establishment's expenditure on R&D activities _____ %

4.1.2 If yes please identify the intensity of experimentation undertaken by your establishment in developing or improving significantly new products? (on a scale from 1 to 5 where 1 is no experimentation and 5 very high experimentation)

No experimentation	Little experimentation	Moderate experimentation	High experimentation	Very high experimentation
1	2	3	4	5

5. Obstacles

5.1 During the three years, 2006-2009, how important were the following problems and obstacles for slowing down or causing problems for your innovation activities or innovation projects? (on a scale from 1 to 5 where 1 is not relevant at all and 5 very high)

	Not relevant (1)	Low (2)	Moderate (3)	High (4)	Very high (5)
a. Lack of funds within your establishment for innovation	1	2	3	4	5
b. Lack of finance from sources outside your establishment for innovation	1	2	3	4	5
c. Innovation costs too high	1	2	3	4	5
d. Lack of qualified personnel to work on innovation projects	1	2	3	4	5
e. Lack of information on technology	1	2	3	4	5
f. Difficulty of identifying cooperation partners for innovation	1	2	3	4	5
g. Inability to devote staff to innovation projects on a on-going basis because of production requirements	1	2	3	4	5
h. Risk related to the feasibility of the innovation project	1	2	3	4	5
i. Governmental regulations	1	2	3	4	5

5.2 During the three years, 2006-2009, how important were the following barriers and obstacles hindering export development (on a scale from 1 to 5 where 1 is not important at all and 5 crucial)

	Not important (1)	Moderately important (2)	Important (3)	Very important (4)	Crucial (5)
a. Lack of information about foreign markets and business opportunities	1	2	3	4	5
b. Lack of internal workforce and capability to deal with export development	1	2	3	4	5
c. Difficulty to matching brands and style to specific markets	1	2	3	4	5
d. Difficulty of matching market prices	1	2	3	4	5
e. Difficulty to identify and to access export distribution channel	1	2	3	4	5
f. Keen competition in overseas markets	1	2	3	4	5
g. High tariff and nontariff barriers	1	2	3	4	5
h. Unfamiliar foreign business practices/difference social cultural traits	1	2	3	4	5
i. Lack of excess production supplied to be exported	1	2	3	4	5

6. Technology and environment

6.1 Please indicate the geographical location of other businesses or organizations with which your establishment used as sources of information for the following technological activities during the last three year, 2006-2009

	Local/regional	National	USA	South America	Europe	Australasia	Other countries
a. Mechanized viticulture							
b. Grape stocks							
c. Irrigation practices							
d. Specification and testing							
e. Pest management							
f. Use of enzymes							
g. Grapevine hardiness against winter							
h. Control of winemaking practices (particularly fermentation control)							
i. Wine-making technology							
j. Chemical methods of grape and wine analysis							

6.1 Does your establishment use or subcontract winemaker facilities and/or consultant? (Yes or No)

6.2 Does your establishment practices organic agriculture? (Yes or No)

7. Establishment's characteristics

7.1 Indicate how many employees in your establishment

7.1.1 in 2009 _____

7.1.2 in 2006 _____

7.2 Of your total employees in 2009

7.2.1 How many were oenologists or agronomists _____

7.2.2 How many have technical degrees _____

7.2.3 How many have university degrees _____

7.3 Of the current workforce with technical and university degrees, how many are recruited in the following regions?

	Local/regional	National	International
7.3.1. Oenologists & agronomists			
7.3.2. Managerial & professional			
7.3.3. Technicians & skilled manual			

7.4 When was your firm established in this region _____

7.5 Is your establishment

a) Independent

b) Part of a larger group of firms

c) Other (e.g. cooperatives)

7.6 Please estimate (as best you can) the total business revenue of your establishment

7.6.1 in 2009 _____

7.6.2 in 2006 _____

7.7 Please estimate (as best you can) the total cost of labor as a percentage (%) of the establishment total cost of production?

7.8 Please estimate (as best you can) the percentage of your establishment total revenue in the following geographical market in 2009 (total 100%)

a) In your province/territory _____

b) In the rest of Canada _____

c) United States _____

d) Europe _____

e) All other countries _____

7.9 Please estimate (as best you can) the volume of wine produced in liters

7.9.1 in 2009 _____

7.9.2 7.9.2 in 2006 _____

7.10 Please estimate (as best you can) the average price of wines produced by liter

7.10.1 in 2009 _____

7.10.2 in 2006 _____

7.11 Would you be willing to be further interviewed on issues relating to these topics (approximately 45 minutes)? (Yes or no)

7.12 Would you be interested in receiving a copy of the survey report (Yes/no)

APPENDIX B: INNOVATION DYNAMICS OF OKANAGAN VALLEY, NIAGARA PENINSULA AND THE REST OF CANADA

Table 22 Innovation activities

	Total	Location			Sub-regions		
		BC	Ont.	Qc	Niagara	Okanagan	Others
n=	*146*	*49*	*57*	*40*	*26*	*31*	*89*
Internal R&D	79.5	73.5	78.9	87.5	76.9	74.2	82.0
External R&D	39.7	38.8	40.4	40.0	42.3	41.9	38.2
Acquisition of external knowledge	74.7	71.4	70.2	85.0	73.1	74.2	75.3
Acquisition of equipment	87.7	81.6	87.7	95.0	84.6	93.5	86.5
Training	78.8	71.4	78.9	87.5	76.9	77.4	79.8
Commercial activities	78.1	69.4	82.5	82.5	69.2	80.6	79.8

***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level
If the dimension and the characteristics are significant, the * appears at the right of the column

Table 23 Sources of knowledge for innovation

	Total	Location			Sub-regions		
		BC	Ont.	Qc	Niagara	Okanagan	Others
n=	*146*	*49*	*57*	*40*			
Market sources							
Clients and customers	74.0	67.3	77.2	77.5	73.1	74.2	74.2
Suppliers	56.9	46.9	68.4	52.5*	42.3	61.3	59.6
Competitors	41.8	32.7	50.9	40.0	30.8	45.2	43.8
Business service companies	32.9	26.5	31.6	42.5	23.1	29.0	37.1
Institutional sources							
Universities	22.6	16.3	22.8	30.0	15.4	22.6	24.7
Colleges/technical institutes	23.3	24.5	21.1	25.0	19.2	19.4	25.8
Federal government agencies	19.9	20.4	21.1	17.5	23.1	22.6	18.0
Provincial government agencies	17.8	14.3	19.3	20.0	19.2	16.1	18.0
Other sources							
Industry associations	37.7	34.7	45.6	30.0	34.6	41.9	37.1
Conf., trade fairs, exhibitions	60.3	57.1	63.2	60.0	53.8	67.7	59.6

***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level
If the dimension and the characteristics are significant, the * appears at the right of the column

Table 24 Types of innovation development

	Total	Regions			Sub-regions		
		BC	Ont.	Qc	Niagara	Okanagan	Others
n=	*146*	*49*	*57*	*40*	*26*	*31*	*89*
Product	84.2	75.5	87.7	90.0	80.8	87.1	84.3
Growing techniques	53.4	51.0	49.1	62.5	73.1	45.2	50.6
Production techniques	56.2	53.1	54.4	62.5	69.2	61.3	50.6
Managerial techniques	20.5	16.3	19.3	27.5	23.1	25.8	18.0
Marketing strategies	51.4	49.0	50.9	55.0	50.0	58.1	48.4

***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level
If the dimension and the characteristics are significant, the * appears at the right of the column

Table 25 Innovation barriers

	Total	**Location**			**Sub-regions**		
		BC	Ont.	Qc	Niagara	Okanagan	Others
n=	*146*	*49*	*57*	*40*	*26*	*31*	*89*
Lack of internal funding	54.1	49.0	54.4	60.0	46.2	61.3	53.9
Lack external funding	46.6	49.0	43.9	47.5	53.8	48.4	43.8
Innovation costs too high	43.2	42.9	29.8	62.5**	46.2	29.0	43.2
Lack of qualified personnel	39.7	36.7	40.4	42.5	46.2	35.5	39.3
Lack of information on technology	21.2	16.3	15.8	35.0*	23.1	12.9	23.6
Difficulty of identifying partners	21.9	20.4	12.3	37.5**	19.2	12.9	25.8
Inability to devote staff	50.7	51.0	49.1	52.5	46.2	51.6	51.7
Feasibility risks	26.0	22.4	22.8	35.0	26.9	32.3	23.6
Governmental regulations	38.4	32.7	45.6	35.0	30.8	51.6	36.0

***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level
If the dimension and the characteristics are significant, the * appears at the right of the column