

3 Higher education institutions in entrepreneurial ecosystems

Collaboration with wider society is a prominent feature of Québec's higher education system and institutions. The provincial innovation strategy leverages this to create entrepreneurship ecosystems. This chapter illustrates this dynamic and discusses the opportunities and challenges ahead for promoting sustainability and inclusiveness.

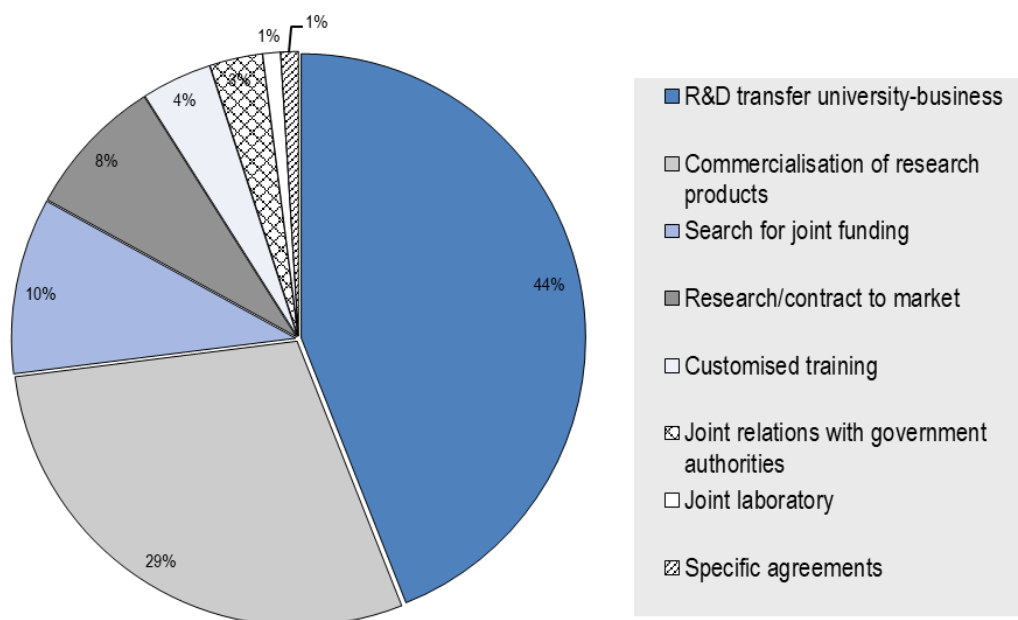
Québec's HEIs are invested in collaborating with their regional ecosystems. Their propensity for collaboration relies on a variety of factors, including for instance, the increasing importance of entrepreneurship in higher education as a specific mandate, as demonstrated in the University of Québec network, and the function of promoting skills in regional communities, as in the case of Cégeps and CCTTs. Québec HEIs have played a pivotal role in the creation of entrepreneurial ecosystems, through incubators and accelerators that support local entrepreneurs and firms. The positive trend in entrepreneurship in the province has a spatial component, and its “entrepreneurial ecosystems” are flourishing. Further incentives for researchers and professors, and better organisation of resources, activities and aims, can spur collaboration and help institutions to become more “place-responsive”.

Québec HEIs have a tradition of collaboration with their ecosystems

In general, Québec HEIs collaborate successfully with their regional communities. Collaboration occurs in different forms. HEIs may offer training and education programmes to meet regional labour market needs and opportunities; they engage in applied research and knowledge transfer services to support innovation in regional industries; they offer entrepreneurship education to help students and researchers create local businesses and engage with social entrepreneurial opportunities; and they generate social innovation, enhancing cohesion, trust and inclusion. In Québec, the most typical university-business interactions involve technology transfer and R&D (Figure 3.1). Product commercialisation; co-financing and market research, are also common formats of collaboration.

Figure 3.1. Themes in university-business collaboration in Québec, according to firms

The share of themes representing partnerships between universities and businesses



Source: (Adam, 2016^[1])

In Québec, as in the rest of Canada, firms located in a radius of between 10 to 25 kilometres from HEIs are more likely to co-operate with them in R&D projects (measured through R&D expenditure), benefiting from knowledge spill-overs. The province displays slight differences with the Canadian average when taking into account the size of firms collaborating with HEIs, which tend to be larger. This difference may depend on the human geography of Québec, which has denser networks of cities and rural villages than the rest of Canada. On average, more people per square kilometre live in rural Québec than in rural Canada.

Box 3.1. Innovative tools to assess the “geography of higher education”: Statistics Canada’s Linkable File Environment

Recent research on measuring the impact of knowledge transfers on regional innovation ecosystems in Canada showcases the use of such innovative statistical tools as the Linkable File Environment (LFE). The LFE links a wealth of survey, administrative and census data on the Canadian business environment. It positions these surveys and administrative data to support longitudinal and cross-sectional analysis and offers opportunities to use additional variables to assess entrepreneurship, employment, productivity and competitiveness. The objective is to update the linked files with the most recent year of available data for the various sources, providing a longer series of data for longitudinal and cross-sectional analysis. Using detailed geographic information from different data sources, the LFE can connect data of a specific HEI and specific firms at the micro level to measure the effect of knowledge spill-overs on regional innovation.

Source: (Statistics Canada, 2021^[2])

Factors that facilitate collaboration between Québec HEIs

Different factors affect HEIs’ propensity towards collaboration in Québec. The increasing importance of entrepreneurship in higher education was discussed in Chapter 2, and all case-study HEIs visited in Québec actively support entrepreneurship. In some cases, the engagement with entrepreneurship has affected the organisation of the institution, making it more likely to engage with its ecosystem. This tendency was particularly strong in certain places. Montréal is becoming an entrepreneurship hub, thanks to its HEIs’ capacity to generate incubators and accelerators that play an important role in the metropolitan ecosystem. Most Montréal-based incubators are opened to all entrepreneurs and start-uppers, including those who are not linked to HEIs. In addition, the provincial government is co-investing in several of these, including the Campus Montréal in the city, and generates such visible structures as Campus Mil.¹ The best example of the capacity to connect excellent academic research with entrepreneurship and business services provided to the ecosystem is MILA (see below), which is many things at once: a research centre specialised in both basic and applied science, an incubator and a partner for local businesses operating in AI technologies. MILA, notably, emerged from a collaboration of different Montréal-based HEIs, including both the French-speaking Polytechnique of Montréal and English-speaking McGill University.²

Entrepreneurship also features collaboration in non-metropolitan Québec. Entrepreneurial HEIs in Sherbrooke and Québec City offer services to entrepreneurs and firms of all sizes and maturity within their own communities and networks. In Sherbrooke, the UdeS supports entrepreneurs and firms through organisations like the *Groupe de partenariats d'affaires* (GPA). Sherbrooke Innopole is the local economic development organisation promoting high-value-added economic activities. UdeS plays a pivotal role in setting up the Innovation Zone of Sherbrooke Innopole, a provincial policy promoting knowledge-intensive businesses in non-metropolitan Québec. GPA connects innovation needs of local businesses with research activities at UdeS. It manages, on the one hand, to overcome the mistrust of businesses of the

possibility of applying academic research, and on the other hand, academic researchers' resistance to engage with applied research that does not generate opportunities for publication. According to local stakeholders, the presence of the GPA in the local ecosystem makes Sherbrooke more attractive for businesses. The GPA is a project of the City of Sherbrooke and of MEIE (funders) and is hosted by the UdeS. It has a yearly budget of CAD 1.3 million.³

Some factors supporting the collaboration of HEIs are peculiar to Québec. For example, some HEIs are specifically designed to provide tailored services to their own communities. That is true of the University of Québec (Université du Québec) network, created in 1968, which encompasses 10 provincially run public universities, mostly in smaller cities surrounded by rural areas. In total, this network enrolls about 90 000 students and co-ordinates over 300 programmes. These provincial universities have the explicit role of facilitating access to higher education for all, regardless of their location in Québec, and promoting regional economic development through their research and collaboration.

Cégeps are another example of HEIs that are specific to Québec. Cégeps are publicly funded colleges that offer academic, technical and vocational programmes. They are connected to academia, in that they offer two-year programmes that are required to access university education. They can also offer technical and vocational programmes, including three-year professional programmes, micro credentials and adult education. When engaging in these areas, in particular, Cégeps tend to reflect the needs and opportunities of the local productive sector. For example, the Cégep of Saint-Jérôme has a well-developed lifelong learning centre. With 25 staff, the centre partners with local firms to identify skills needs and generate training opportunities accordingly. Co-specialisation of teaching and training helps increase collaboration activities, which are carried out mostly by CCTTs.

These centres of applied research offer technical support, training and specialised information to the local business sector and in particular to small and medium-sized enterprises (SMEs), which represent 61% of CCTTs' partners, on average (Gouvernement du Québec, 2013_[3]). CCTTs are specialised in productive sectors, with the goal of generating applied research and support for businesses in the industry that the local productive sector specialises in. CCTTs echo international models, especially from countries where professional higher education is particularly well-developed, such as Inspire AG at the Swiss Federal Institute of Technology in Zürich (ETHZ) (Box 3.2). The interesting feature shared by CCTTs and Inspire AG is the space they occupy in the division of labour between academic institutions and industry. Both Inspire AG and CCTTs are intermediary organisations, staffed with non-academic scientists and engineers. Such staff has a particular profile, different from academic researchers'. They not only have the incentives, but are highly motivated to work with (and even within) companies, and SMEs can benefit. However, the academic environment is not far and many potential connections – through PhDs, postdocs and faculty engagement, allow academic research and knowledge to spill over to the intermediary institution and eventually to the SMEs.

Sectoral specialisation of CCTTs can vary in capital-intensive or in more traditional sectors, related to craftsmanship or farming. For instance, the Innovative Vehicle Institute, the CCTT in Saint-Jérôme, promotes specialisation in the automotive sector, capitalising on the regional specialisation of the Montréal functional area, to which Saint-Jérôme belongs. Another example is the *Centre d'innovation en ébénisterie et meuble* (Centre for Innovation in Cabinetmaking and Woodworking, or INOVEM), attached to the CÉGEP of Victoriaville, which generates applied research, technical assistance and business training in the production of furniture and other wood products.

In general, CCTTs are in a positive cycle. The increasing number of clients (with a growth rate of 19% between 2016-2017 and 2020-2021) and the growth of income they generated (a growth rate of 56.9%,⁴ in the same period) are indicative of the relevance of this network of organisations for the regional economy. Collaboration activities take place in the surrounding community of CCTTs. For instance, 36% of partnerships with enterprises of the CCTT in Trois Rivières – *the Centre de métallurgie du Québec* (Quebec Centre of Metallurgy, or CMQ) – are within a 5-kilometre radius. Thanks to these trends, the

provincial government is encouraging CCTTs to increase the share of funding they obtain by selling their products and services to businesses. This may generate opportunities for reorganising and reorienting the activities of some centres, by diversifying what they offer to entrepreneurs and firms of every size and maturity.

Box 3.2. Inspire AG – a case study: “Coasean” entrepreneurs and responsive professors (Switzerland)

The history of Inspire AG is the story of the formation and development of a Coasean institution – an alternative institutional form that provides a solution to certain market and co-ordination failures – in the area of knowledge and technology transfer. Inspire serves to maximise knowledge and technology transfer from a research institute in the Federal Institute of Technology of Zürich (ETHZ) to the surrounding SMEs. Inspire is a small organisation, composed of 6 ETHZ professors, 60 employees (mostly senior scientists and graduate students) and 10 research groups. In 2017, it ran about 70 projects of knowledge and technology transfers.

Partnerships between an SME and an Inspire research group are directly funded by the SME or subsidized by the federal innovation agency, which can cover up to 50% of the costs. Part of the turnover (27%) is also government-supported (under *la loi sur la recherche*, LERI Article 15) and 6% is ETHZ contribution in kind (time spent by the six professors on oversight and co-ordination).

Inspire thus offers an interesting innovative design, which can greatly increase the responsiveness of a university towards SMEs’ needs and opportunities, by solving the two main obstacles. First, it cancels out the disparity in motivation and interest between professors and SMEs, since professors stay in the background, so to speak, and the main contact partners of the SMEs are the research groups. Second, Inspire provides university research with access to a critical mass of projects, cases and opportunities, which makes them (and the SMEs) an interesting partner for ETHZ.

Source: (Inspire AG, n.d.^[4])

Intermediary organisations and policies support all HEIs in connecting to stakeholders

Additional factors supporting the collaboration agenda of Québec HEIs are entities and policies put in place by the federal and the provincial government. For example, Mitacs is a federal non-for-profit organisation operating in Canada since 1999 with the purpose of stimulating innovation by driving collaboration and facilitate access to skills and talent. Via various programmes of internships, it connects students (from undergraduates to post-doctorates) of Canadian post-secondary institutions (colleges, polytechnic, and research universities) to external organisations, including businesses, hospitals, municipalities and non-for-profit organisations, to generate solutions to real-world challenges and support job placement.⁵ Mitacs has developed several research and innovation programmes and has expanded its original focus on applied research in the field of STEM and social innovation. Importantly, Mitacs has developed specific programmes to support entrepreneurship and transversal skills in higher education (Box 3.3). It benefits from the support and funding of the federal and provincial government through Innovation, Science and Economic Development Canada (ISED), which invested CAD 708 million in 2021 in funding over five years to create 85 000 innovation internships. In addition, under the *Stratégie québécoise de recherche et d’investissement en innovation 2022-2027* (SQR12), an additional CAD 60 million from the provincial government has been committed to the Mitacs programme.

In fact, support from provinces is key to Mitacs’ success. In Québec, the MEIE contributes on average to 24% of a Mitacs-supported grant, and the partner enterprise to 50%. Mitacs has offices in regional centres

(Montréal, Ottawa, and Toronto) as well as representation across the country, usually under the form of advisors, based on university campuses (MITACS, n.d.^[5]).

Box 3.3. MITACS supporting entrepreneurship and transversal skills

Mitacs supports entrepreneurs in higher education as well as transversal skills to promote an entrepreneurial mindset and empower students in relation to the future of work. Mitacs Entrepreneur International (MEI) links start-ups to Canadian HEI's incubators and accelerators that are connected to international networks. They also provide financial support to help with business travel costs. The objective is to help entrepreneurs seek market opportunities abroad and access foreign investment opportunities. Due to the COVID-19 pandemic, the programme's growth for the 2021-22 fiscal year was moderate, with only 28 MEI internships delivered, although this number is expected to increase. In an exit survey, entrepreneurs who participated in the programme reported a 29% improvement of products and services and a 42% increase in attracting investments. In addition, 84% of participants also noted that they received enquiries from investors and partners over the course of the programme.

Mitacs also offers students in Québec and Canada access to special training through courses, workshops and networking events. It offers courses in transversal skills, particularly in project and time management, career planning, R&D management skills, networking and leadership skills. The number of participants in such training programmes has increased continuously since 2016, with a surge in attendance during the pandemic, as courses were offered online. In addition, Mitacs collaborates with the Innovation and Impact network of Canada (I-INC) to enhance knowledge transfer through different initiatives, such as the Lab2Market program, a 16-week programme for graduate, postdoctoral and faculty that provides training to support start-up creation, commercial development and IP development.

Source: (MITACS, n.d.^[5])

The Québec government is also active in promoting the collaboration and entrepreneurial agenda of all its HEIs. One of the major initiatives is Axelys, a non-profit organisation that is the main technology transfer and knowledge exchange vehicle in Québec. The provincial government created Axelys in April 2021, by streamlining and centralising the offer of technology transfer services (TTOs) stemming from public research. Axelys is governed by a board presided by the Innovator in Chief of Québec – and is therefore connected with overall provincial innovation strategy and the *Conseil de l'Innovation*, as noted earlier. In a simplified way, Axelys is responsible for promoting transfers between HEI and industry in terms of public research. Beyond technology transfer, its mission includes the development of entrepreneurial ventures stemming from public research, and knowledge exchange of non-technology, social and cultural, innovations. It has deployed CAD2.8 million of funding to collaborative projects to support such mission. They created and led a roundtable where all relevant stakeholders including FRQ, incubators and accelerators, VCs, work on developing a number of new initiatives to promote and grow scientific entrepreneurship, including an awareness-raising activity program. Their “innovation brokers” are agents dispersed in HEIs and can play a role in promoting an entrepreneurial culture within these institutions.

In the vision of the provincial government, and in line with the SQRI 2, “*Axelys will enable Québec companies to improve their competitiveness, increase the number of start-ups, create good jobs, and adopt more innovations that will have an impact on the well-being of Québec's society*” (Société de valorisation et de transfert du Québec (SVTQ), 2021^[6]). Axelys focusses on science-based ventures (graduate scientists and researchers) and uses both “push” and “pull” approach to innovation. Push, “idea-driven”, is the main approach used by Axelys where it looks for IPOs in HEIs and other PRBs and mobilises its resources to transform these ideas/prototypes/startups into actionable innovations and commercialise them. Axelys increases the value of academic research results by developing an appropriate IP strategy, analysing market opportunities, and financing the later stages of R&D to create high value products or

prototypes. These innovations can then be licenced or sold to companies, but they can also serve as a basis for the business model of a startup company. Such academic startups are then eligible to VC funding, notably to Eureka, a novel CAD 100 M pre-seed venture fund capitalized by the Québec government. The aim of Axelys is to double the number of start-ups in universities and PBRs, in five years. Whereas in the pull approach, Axelys offers to industry and community the possibility to work with their partner research institutions that can offer their expertise and solutions to develop solutions to economic (industrial) and societal problems. Once fully operative, Axelys funding system would be a mix of public and private funding, with the former generating 80% of overall funds. Axelys reflects an international trend supporting the commercialisation of innovation to generate economic development and social benefits. The Axelys model aims to support the commercialisation of academic research results. Other models in the world have gone even further, for example Vinnova in Sweden., which supports the commercialisation of academic research results (Box 3.4).

Box 3.4. Case Study: Vinnova (Sweden)

Vinnova is a Swedish agency under the Ministry of Enterprise and Innovation. With its offices in Stockholm and Brussels, it also serves as the Swedish contact for the European Union (EU) Framework Programme for Research and Innovation. The agency has around 200 employees and generates long-term visions and strategies for the Swedish research and innovation system. Vinnova encourages the collaboration between universities, industry, public organisations, civil society and others, with a view to international diversification.

In fulfilling its mandate to support innovation, Vinnova finances early-stage innovation ideas. These often entail great risk and require government aid. Thanks to the support of the agency, businesses and other organisations are able to test new ideas before they become profitable, which helps promote the general propensity towards innovation in the system. Vinnova has an annual budget of approximately EUR 280 million, most of which is distributed to a selection of the many funding proposals submitted. Funded projects are continuously monitored.

Innovation has a better chance when knowledge and skills in different fields can interact and create new, interdisciplinary fields. This is why Vinnova focuses on stimulating cross-collaborations among universities, research institutions, industry and public services. In addition, it supports research to identify solutions to emerging social challenges, such as the ageing population, or the energy transition and sustainability agenda.

Source: (VINNOVA, n.d.^[7])

HEIs can help boost the results of innovation. The increased investment in research creates further avenues to promote local collaboration to boost local development. HEIs in Montréal create spill-overs for the locality within the specialised sectors – artificial intelligence, engineering, life sciences – in collaboration with strong players. This can turn into local growth. In turn, HEIs in the rest of Québec create spill-overs in collaboration with external partners. Nevertheless, evidence of their impact is limited.

Finding the right balance between excellence and co-specialisation in regional ecosystems

Reflecting an international trend, collaboration activities of Québec HEIs reflect the features of the ecosystem in which they operate; collaboration agenda of HEIs located in metropolitan areas differs from those in places where there is a lower density of inhabitants and economic activities tend to be more

specialised (Kempton, 2015^[8]; Goddard, Kempton and Vallance, 2013^[9]). Because of its human geography, and the importance of the rural dimension in the economy and society of Québec, the province represents an ideal case study to discuss the role of place responsive HEIs and the “geography of higher education”⁶. By “spatialising” the analysis, it is also possible to identify common challenges that all HEIs face when trying to fill the gap between research and innovation (through entrepreneurship) in their communities. Québec HEIs are distributed all over the province, in the metropolitan area of Montréal as well as in non-metropolitan regions, which can be divided in turn into cities and rural places.

Innovation leaders in the Montréal metropolitan area

The metropolitan area of Montréal features diffused innovation, with booming start-up dynamics (see Chapter 2). Its entrepreneurial ecosystem is well developed, and it is based on 18 HEIs, including universities and colleges, incubators and accelerators and other entities supporting innovation and entrepreneurship in different forms. Several of the HEIs that operate in this ecosystem are established as research poles, offer a wide variety of programmes under an interdisciplinary lens, and compete and connect with a broad international network of champion HEIs.⁷

Montréal-based large research universities, because of their size and the high density of stakeholders in their community, can mobilise professional resources and functions that specifically support the collaboration and entrepreneurial agenda.⁸ For instance, the University of Montréal (UdeM) is expanding from its historical location on the Mont Royal to create a new campus. The goal is to increase interaction between the university community and MILA, in particular, which will be integrated into the new spatial organisation of the UdeM. The campus will also house Millennium Québecor (see Chapter 2), supported by a private donation, which aims to promote entrepreneurship education in the Montréal ecosystem. The localisation of the Campus Mil in the area adjacent to the digital cluster (Montréal being one of the world capitals of the video-game industry) suggests an intent to generate knowledge spill-overs and a vibrant start-up environment. Surprisingly, however, these initiatives appear to be poorly co-ordinated with the local government⁹ and are not wholeheartedly supported by the local population. The Campus is located in one of the most impoverished areas of the city, and local households are facing gentrification, with the recent increase in real estate prices and property taxation.

Another important player in the metropolitan area is HEC Montréal. HEC (*Hautes études commerciales*) is a leading business school in North America that has developed a successful programme in entrepreneurship that reflects the characteristics of the local ecosystem.¹⁰ HEC specialises in supporting family businesses and “repreneuriat”, where university-trained entrepreneurs take over established businesses. On this topic specifically, *l’Observatoire de la base entrepreneuriale*, is a center for research, reflection and exchange on entrepreneurship, business creation and SME takeovers. In addition, HEC is specialised in entrepreneurship in the health system (in hospitals and other types of health centres), one of the main specialisations of the Montréal ecosystem. HEC also houses an entrepreneurship observatory that produces a report and a certification service for incubators (HEC Montréal, 2023^[10]; HEC Montréal, n.d.^[11])

Another good example of this dynamic is McGill University’s Technology Transfer Office (TTO). McGill has started considering patents and inventions in the internal evaluation of its faculty. This is an important step in encouraging collaboration and helping researchers to commercialise the fruits of their research activities. The TTO supports faculty facing the trade-off between publishing and patenting – for instance by offering the possibility of temporary patents.

The HEIs in Montréal differ in the clientele they serve and in their specialisation. HEC, for example, is focused on the Québécois entrepreneurship ecosystem, while McGill tends to have a broader, more international focus, building connections with alumni who have created successful businesses, sometimes outside Québec.

Montréal benefits from the extensive investment in biopharmaceuticals and medical technologies. The city has a critical mass of specialised companies, prestigious educational institutions and centres of excellence. This rich, dynamic environment is particularly conducive to the creation of scientific and industrial partnerships, which have access to a huge pool of talent for developing and commercialising drugs, technologies and other cutting-edge products (Montréal International, 2022^[12]). The Greater Montréal area has several other assets in play. A world leader in artificial intelligence, it has attracted a growing number of companies interested in taking advantage of the expertise and networks in place to advance their research activities in life sciences and health technology (Montréal International, 2022^[12]).

MILA, the Québec AI Institute (originally Montréal Institute for Learning Algorithms) is the most important attractor of talent in the Montréal area. It is a collaboration between McGill and Campus Montréal (University of Montréal, Polytechnique of Montréal and HEC Montréal), and involves 875 researchers, split into two groups. One is dedicated to basic research (a sort of fellowship mostly based on academics) and the other focuses on applied research and is directly employed by MILA. MILA depends on co-operation with business. Companies pay a fee to have access to MILA's research and the possibility of generating more structured collaborations. In this way, the private sector can support curiosity-driven research but also engage in proof-of-concept activity. Its star researchers make MILA visible and attractive at the international level, but the "extension" structure allows MILA to collaborate with the private sector. MILA actively supports entrepreneurship and generates start-ups that can benefit from using its accelerator, MILA Entrepreneurship Lab (MILA, n.d.^[13]). MILA has been inspirational for Québec policies trying to improve its development (which has given the centre a pivotal role in the provincial innovation strategy) and replicates the experience in other sectors/territories. Similarly, IVADO, the provincial research institute in artificial intelligence, is a Québec-wide collaboration in digital intelligence, AI and machine/deep learning, dedicated to transforming new scientific discoveries into concrete applications to benefit society. IVADO received CAD 86 million from the federal government in 2016, under the federal programme Apogée, in line with local HEIs' decision to specialise in AI.¹¹ IVADO will receive an additional CAD 120 million in the next phase of the project. It is active in education, research and technology transfer, and has a programme in entrepreneurship that assists researchers to become entrepreneurs (Scientist in Action) or to contribute to existing businesses (Scientist in Residence). These activities are inspired by I-Corps (extension services).

From March to June 2022, the 13 participating SMEs completed the first phase of "Looking to Data", a training curriculum in digital intelligence, for which Investissement Québec (IQ) called on IVADO for its access to state-of-the-art knowledge and recognised experts on data science and AI. While the impact of this programme is slight, due to the limited number of SMEs involved, it shows the possibility of connecting AI with different sectors, including traditional ones, to improve innovation capacity and the productivity of firms of all size and maturity.

HEIs in non-metropolitan Québec

HEIs in urban areas

Québec has a network of cities that include Québec City (the *Capitale-Nationale*), Sherbrooke, Trois Rivières and other cities of national relevance. Important economic poles, they enjoy good regional accessibility and, in some cases, direct linkages with the Montréal area. These cities are home to HEIs such as Laval University, which is the oldest in the province, the University of Sherbrooke – both case studies in this report – and several Cégeps and CCTTs.

HEIs located in these cities have developed knowledge exchange activities that meet the specific needs of their communities, which tend to be less economically diversified than the metropolitan area of Montréal and have a less dense productive fabric. Against this backdrop, HEIs can respond to local stimuli while remaining connected with international research networks.

The University Laval is good example of this capacity to operate both internationally and regionally. On the international front, the university contributes to the Sentinelle Nord (SN) programme. This strategy encourages a convergence of expertise, transformative research, development of new technologies and the training of a new generation of interdisciplinary researchers aimed to improve understanding of the northern environment that characterises some regions of Québec. SN brings together a vast network of researchers from more than 40 departments at Université Laval, who work closely with northern organisations, public and private sector bodies, as well as other universities and research institutes in more than 20 countries (Laval University, n.d.^[14]). As for the regional level, the university is piloting a model of a “squad”, a team of a limited number of researchers dedicated to searching for collaborations with the universities’ surrounding ecosystem. The researchers’ responsibility is to search actively for private and public partnerships in which the university can play a key role. Laval University is also engaged with the scientific entrepreneurship initiative of the *Fonds de Recherche du Québec* (FRQ) and V1Studio, part of the new Axelys framework.

Sherbrooke also offers noteworthy examples of the capacity to connect to the local ecosystem while generating relevant international research and breakthrough innovations. The UdS is one of the main players in the development of the local Innovation Zone in quantum sciences, one of the main pillars of the provincial innovation strategy (see detailed discussion in the next chapter). The UdeS co-operates closely with local authorities to react to economic downturns (for example, the de-industrialisation that Sherbrooke has suffered in the past decade) and generate innovative development scenarios for the community.

HEIs in rural communities

Québec is also home to HEIs that operate in more rural settings. The economic fabric of these regional urban centres tends to be specialised in a given sector, often connected with resource-based activities. As noted earlier, the provincial government created the system of the University of Québec specifically to provide access to higher education in these rural communities and to promote local economies.

This report assessed several case study HEIs in to this category. The University of Québec in Rimouski, a relatively small HEI with a student body of about 7 000 students, nevertheless produces excellent research, especially in marine biology, Arctic ecosystems and sustainability. This has helped to generate a local ecosystem of organisations and entities directly or indirectly affiliated with UQAR research. They include the *Institut des sciences de la mer de Rimouski* (ISMER), a globally renowned research centre in marine biology, which has attracted research funds from the federal government (as part of Canada’s Ocean Supercluster) and from abroad. The concentration of research activities paved the way for intermediation, which is provided by the ISMER. This contributed to the creation of the *Centre de recherche sur les biotechnologies marines* (CRBM), in recognising the need for different players and roles in the innovation ecosystem. CRBM is a research and technology organisation (RTO), active in providing support to firms of all size and maturity, although it is not specialised in incubation/acceleration for start-ups.

UQAR is also active in collaboration and co-creation. The engagement agenda has a central role in UQAR (as in the rest of the University of Québec system), and the university is required to promote regional development and the well-being of the community. The university plays an important role generating innovation spill-overs and is considered to be a local anchor by the *Société de Promotion Économique de Rimouski* (SOPER), which has designed a regional development strategy that leverages the knowledge and innovation capital generated by UQAR. The SOPER has created a local accelerator, NOVARIUM, located in front of the university campus, to generate support for scientists who would like to commercialise their innovations. NOVARIUM, while it is a recent addition, is an important element in the Rimouski ecosystem, given its capacity to provide specialised services supporting academic entrepreneurs (doctoral students in particular). A good example of a provincial network supporting entrepreneurship and start-ups, NOVARIUM is formally and informally linked with the new innovation framework developed around Axelys

and interacts with entities such as CENTECH and District 3, generating a positive dynamic of collaboration in the Québec innovation ecosystem in different regions.

After the pandemic, with the migration of highly skilled individuals to non-metropolitan areas. Rimouski presented an ideal environment for an innovation ecosystem outside the Montréal functional area, thanks to its global relevance and its natural amenities.

UQAR can support such positive dynamics by embracing an entrepreneurial agenda. The university has developed activities promoting entrepreneurship, but these are limited to students, and entrepreneurship education is provided only informally and with extracurricular activities, attracting students who already have a demonstrated interest. Promoting entrepreneurship in a more inclusive way (for students and also for external stakeholders) would help to disseminate entrepreneurial perspectives through the local ecosystem. Rimouski could potentially become an important pole for innovation, in addition to research.

The University of Québec at Chicoutimi (UQAC) is another good example of an HEI located in a rural area that is active in engaging with its partners. UQAC's territory consists of an important Indigenous community. The university has a teaching specialisation on Indigenous communities and employs two "research chairs" on its language and culture. UQAC is located in northern Québec, in the French-speaking region of Saguenay-Lac Saint Jean, and has 6 500 students – a third of whom are from abroad. The close connection to its external partners is mentioned in the institution's vision and mission, which stress the importance of access to knowledge that relies on "proximity" to partners and "contribution" to its communities (UQAC, n.d.^[15])

UQAC matches its teaching and research missions on the specialisations of its locality. Typical examples of place-responsive processes to build entrepreneurial capacities and realise business opportunities at UQAC include the programme of intervention *plein air*, the programme in civil engineering and wood construction, and the programme in eco-consulting (*éco-conseil*). An example of co-creation activities of UQAC is the Regional Research and intervention Group (GRIR), which employs collaboration activities through scientific research, including technology transfer, and social innovation, which offer the university community and professionals and researchers in Saguenay-Lac-Saint-Jean about 15 knowledge transfer activities.

UQAC distinguishes itself as a regional leader in social innovation. The *Centre de recherche sur les innovations sociales* (CRISES) conducts research projects on social innovation and social intervention aimed at tackling the challenges of the locality. CRISES, a research centre that includes researchers from all 16 universities and many colleges, is structured around four research axes focused on the contribution of social innovations to social and environmental justice in the following fields: social policies and practices; territories and living environments; social and collective organisations; work and employment. These projects are carried out in close collaboration with local administrations and actors.

The direction taken by UQAC to go further than technology transfer and connect with its partners is a primary example of an HEI tapping into the needs of its surrounding ecosystem. The engagement with the social agenda can also give a new direction to academic entrepreneurship. During the visits, it was noted that most students who create their own enterprises choose to remain in the region. Furthermore, UQAC is a regional leader in aluminium. The campus's Aluminum Technology Center is funded by the National Research Council of Canada. The Center works with its customers and collaborators in the aluminium processing industry to improve manufacturing processes to produce lighter, more economical and more environmentally friendly products (Government of Canada, 2019^[16]). Through the Center, UQAC also connects with the fabric of its territory.

Another example of connecting higher education to local ecosystems in rural settings are Cégeps. Notably, the Cégep of Gaspésie, located in the northern tip of the province, has about 3 000 students and serves to develop technical skills of individuals. The Cégep, given the geographical dispersion of potential students across the region, was an early leader in Québec in providing online courses, even before COVID.

The local economy is driven by a mix of resource-based industries (fishing, forestry, agriculture), public services (health and education), tourism and manufacturing (OECD, n.d.^[17]). The Cégep hosts three CCTTs, in wind power, fisheries and sustainable development. In turn, the Cégep has been instrumental in connecting with local partners to boost the development of local skills (OECD, n.d.^[17]).

A place-responsive approach to innovation and higher education policies

All Québec's HEIs conduct collaboration activities with their external partners, contributing to economic and societal growth in their communities. Whether in metropolitan or non-metropolitan areas, HEIs capitalise on and help to increase the strengths of their communities. The network of the University of Québec as well as the Cégeps and CCTTs, make it possible to connect institutions and partners, particularly through applied research and social innovation.

Thanks to the key role of HEIs, provincial policies are able to enlist HEIs in their regional ecosystems. The SQRI2 Innovation Zones provide opportunities to capitalise on the role of HEIs to strengthen policy synergies between different sectors, such as higher education and regional development, and help create new models for entrepreneurial ecosystems. HEIs can reach beyond technology transfer and include social innovation in their own communities, generating new opportunities and incentives for place-responsiveness.

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Notes

¹ For more information: <https://campusmil.uMontréal.ca/>

² According to local stakeholders interviewed during field visits, MILA represents an important change in the relationship between McGill and the Montréal ecosystem. MILA generates new opportunities for collaboration and identification. McGill representatives consider MILA foundational in terms of the changing relationships between McGill and its local ecosystem.

³ Representatives from GPA have stressed the need to adapt the profile of academic researchers to the new role they may play in local economies. For instance, they suggested revising doctoral programmes by considering the possibility that PhD candidates become Chief Technology Officers.

⁴ This percentage reflects the network of 49 CCTTs. In 2018, the network added 10 CCTTs.

⁵ To connect industry, non-for-profit organisations, municipalities, and hospitals to talent Mitacs developed internship programmes. At the time of writing, Mitacs has two internship programmes, the Business Strategy Internship, the Accelerate, which are opened to all students from undergraduate to post-

doctorates. During these internships, students can apply their knowledge and research skills to help to solve practical problems faced by their employer. Students from diverse study disciplines (law, business medicine) participate in these programmes. Mitacs also has the Elevate Programme, an applied research fellowship for post-doctoral students of Canadian universities. The fellowship is completed in Mitacs' partner organisations to help these get the expertise to solve a pressing research and development (R&D) programme. It also has dedicated international programmes (the Globalink Research Internship programme, the Globalink Graduate Fellowship and the Globalink Research Awards) designed to attract international talent and deploy local talent abroad to help Canadian and international organization solve R&D challenges.

⁶ The Geography of Higher Education (GoHE) aims to improve understanding of how Higher Education Institutions (HEIs) are generating value for their surrounding communities and networks. In particular, GoHE focuses on the impact of national Higher Education policies in empowering communities and individuals by responding to the needs of regions and cities. More information and publications can be found at this link: [https://www.oecd.org/fr/cfe/pme/geo-higher-education.htm#:~:text=The%20Geography%20of%20Higher%20Education%20\(GoHE\)%20aims%20to%20improve%20understanding,their%20surrounding%20communities%20and%20networks](https://www.oecd.org/fr/cfe/pme/geo-higher-education.htm#:~:text=The%20Geography%20of%20Higher%20Education%20(GoHE)%20aims%20to%20improve%20understanding,their%20surrounding%20communities%20and%20networks).

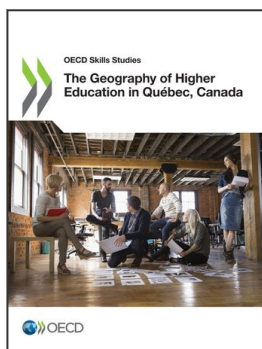
⁷ Some HEIs in Montréal are French-speaking, while others are English-speaking. HEIs such as McGill use both languages. The bilingual HEIs in Montréal can operate within different international networks, tapping into French-speaking areas.

⁸ Because they are located in a globally connected metropolitan area, HEIs have specialised services, benefit from an abundance of partners and can generate a strong interaction with their own ecosystem. However, it is difficult to assess the contribution of HEIs to the competitiveness and sustainability of their own ecosystem.

⁹ Information gathered during site visits.

¹⁰ For more information: <https://www.hec.ca/programmes/certificats/certificat-entrepreneuriat-creation-entreprise>.

¹¹ For more information: <https://www.cfref-apogee.gc.ca/home-accueil-fra.aspx>.



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