THE CONTRIBUTION OF GREATER MONTRÉAL UNIVERSITIES TO THE QUÉBEC ECONOMY

STUDY

OCTOBER 2016

CHAMBRE DE COMMERCE DU MONTRÉAL MÉTROPOLITAIN
BOARD OF TRADE OF METROPOLITAN MONTREAL

MTL INTL MONTRÉAL INTERNATIONAL

STAKING OUR PROSPERITY ON UNIVERSITIES

Universities play a decisive role in the future of society. In addition to being the drivers of a knowledge economy and incubators for skilled labour, they are central to industrial research and development strategies. They are key assets, particularly for Greater Montréal, which is facing serious challenges in terms of productivity and a rapidly aging population.

By transferring knowledge and stimulating its creation, universities help increase the productivity of companies that operate in leading-edge sectors, whose competitiveness is directly tied to the availability of skilled labour and a capacity for innovation.

It is high time we recognize this major contribution to society. Everyone – business people, the government and Quebecers in general – needs to do what it takes to promote the contribution of universities and strengthen their performance.

By leveraging higher education, Québec and Montréal will be on the road to prosperity and make their mark internationally.

Let's take pride in our universities, graduates and research.

Michel Leblanc
President and CEO
Board of Trade of Metropolitan Montreal

KNOWLEDGE IS CENTRAL TO GREATER MONTRÉAL'S ATTRACTIVENESS

Montréal International is pleased to be associated with this study, which shows the essential contribution of Greater Montréal universities to the Québec economy, a strategic role that involves both the creation and transfer of knowledge.

This knowledge, which is the foundation of our attractiveness, delivers clear benefits in terms of innovation, creativity and skilled labour. The QS World University Rankings named Greater Montréal the top university city in Canada, confirming the vitality of its university scene.

This is strong positioning for attracting and retaining international companies and organizations, because the availability of talented labour and university graduates is a decisive factor in choosing where to locate. Given the importance of universities in stimulating economic growth in Greater Montréal, it is essential that we identify challenges and take action to increase the number of university graduates and retain more international students.

This is why Montréal International is proud to join other voices in the community to give education its rightful place and reinforce the attractiveness of Greater Montréal as an international centre for universities and higher learning.

After all, investing in knowledge means investing in prosperity.

Hubert Bolduc
President and CEO
Montréal International

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INTRODUCTION

Education is one of the main drivers of economic development, whether national, provincial or municipal. In today's economy – characterized by a serious productivity challenge and an aging population – this driver is even more strategic. Industry and business competitiveness is directly tied to the education of citizens, business capacity for research and innovation and skills acquisition in leading-edge sectors.

Universities play an essential role in all of this.

- They play a fundamental role in knowledge transmission. Through their teaching mission, they train highly skilled labour and meet the needs of the job market.
- Through their role in knowledge creation, they are a driver of innovation and competitiveness. University research activities promote the advancement of knowledge and, ultimately, its transfer to industry, which can use it to stay at the leading edge and increase competitiveness.

In addition to their economic contribution, universities are also an important source of cultural and social development. Through the involvement of their students, professors and non-academic staff, they have a positive influence on and lend vitality to the community.

This report addresses the economic and social contribution of universities in Greater Montréal from three perspectives:

- the contribution of universities, through the creation and transfer of knowledge, to the prosperity of Greater Montréal, a knowledge society
- economic benefits related to the number of students, particularly foreign students, as well as university expenditures, particularly in research and development
- university and student participation in communities, contributing to their vitality

THE IMPORTANCE OF KNOWLEDGE AND HIGHER EDUCATION TO GREATER MONTRÉAL'S PROSPERITY

In terms of economic development, universities play an important and strategic role, particularly in advanced economics like those of Greater Montréal and Québec. Universities contribute to economic development in two main areas. First, universities play a fundamental role in knowledge transfer. Through their teaching mission, they train highly skilled labour to meet the increasingly complex requirements of the job market. Second, through their equally important role in knowledge creation, university research advances knowledge, the most applied of which is transferred to industries to allow them to innovate and ensure their competitiveness. This section addresses the dual contribution of universities and their impact on the prosperity of Greater Montréal.

An educated population is essential to the prosperity of Greater Montréal

- In advanced economies like those of Québec and Greater Montréal, employment is growing only among highly skilled people, particularly those with a university degree.
- The higher the graduation rates, the greater the level of integration to the job market, as the lower unemployment rate among university graduates shows.
- The prosperity of major metropolitan areas such as Montréal is closely related to university degrees.
- Skilled labour, particularly university graduates, ensures the growth and performance of high-tech sectors in Greater Montréal and stimulates direct foreign investment.
- Universities offer innovative programs that reflect the reality of Montréal's leading-edge sectors.
- The university graduation rate in Greater Montréal remains lower than that of other major Canadian cities.

The fundamental contribution of universities to research and development

- Research is central to the performance of most key sectors in Greater Montréal.
- University research represents close to 40% of all research and development activities in Québec.
- University research intensity is stronger in Greater Montréal than in other major Canadian cities.
- Technology transfer from universities to companies is one of the drivers of innovation.

A major contribution to Greater Montréal's production and prosperity

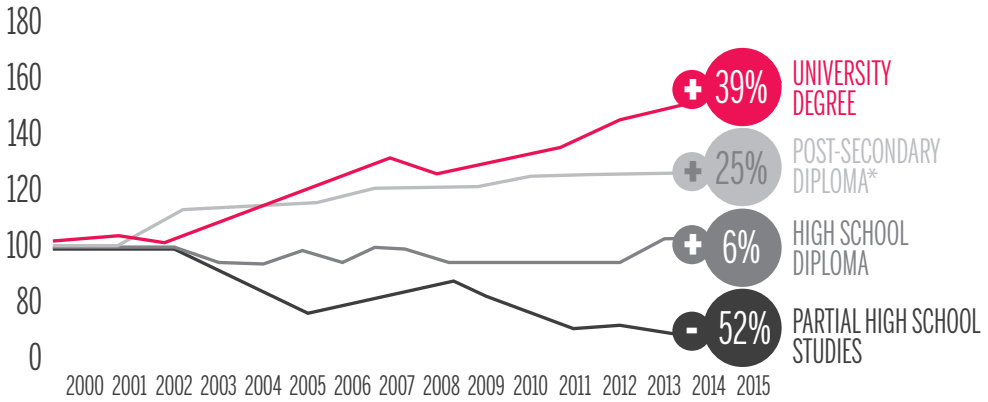
- By helping enhance human capital through knowledge transferred to graduates and promoting the creation and dissemination of knowledge, universities increase the productivity of society as a whole.

1.1. AN EDUCATED POPULATION IS ESSENTIAL TO PROSPERITY IN ADVANCED ECONOMIES

1.1.1. Increases in available jobs in Québec only for skilled workers

For many years in advanced economies, employment has grown significantly only among highly skilled workers. Québec is no exception to this rule. As the following figure shows, over the past 15 years, the number of jobs in Greater Montréal has increased only for those with a post-secondary degree. Growth has been particularly sustained among university graduates[1] (+39% from 2000 to 2015) and more moderate among those with a post-secondary diploma (+25%). The number of jobs requiring a high school leaving certificate has been relatively stable (+6%), whereas it has dropped for those who have not finished high school (-52%). All advanced countries have seen the same evolution toward jobs that require increasingly specialized skills, in particular university degrees.

FIGURE 1
Growth in employment according to highest level of education achieved
2000-2015, 2000=100, CMA of Montréal



* Includes those with a college diploma, a vocational diploma, a university certificate or undergraduate degree, short program.

Sources: Statistics Canada, KPMG analysis.

1 The term "university degree" refers to all graduate or undergraduate university degrees. However, Statistics Canada's Labour Force Survey groups holders of university certificates and short program undergraduate degrees under the category "Postsecondary certificates or diplomas."t les détenteurs d'un certificat universitaire ou d'un diplôme obtenu dans le cadre d'un programme court de premier cycle sous la catégorie « Diplôme d'études postsecondaires ».

1.1.2. Greater integration to the job market among highly skilled people

Job market requirements in advanced economies obviously have a major impact on the level and facility of integration to the job market, which vary according to the level of education. For example, in 2015 in Québec, the employment rate among university graduates was 73.4%, higher than the employment rate among those with a post-secondary degree (see Figure 2). Furthermore, the unemployment rate among those with a university degree (6.2%) is much lower than that among those who have a high-school leaving certificate (9.4%) or a post-secondary diploma (7.2%), indicating that periods of unemployment are fewer or shorter among university graduates (see Figure 3).[2]

FIGURE 2
Employment rate according to highest degree obtained
2015, Montréal

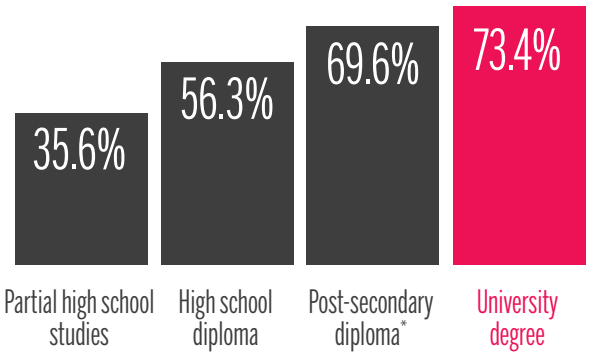
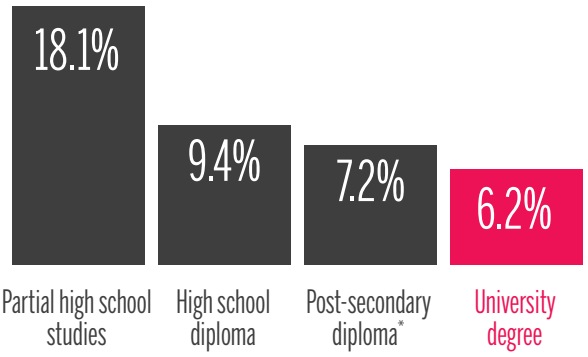


FIGURE 3
Unemployment rate according to highest degree obtained
2015, Montréal



* Includes holders of a college deploma, a diploma of vocational studies, a certificate or a degree obtained as part of an undergraduate university short program.

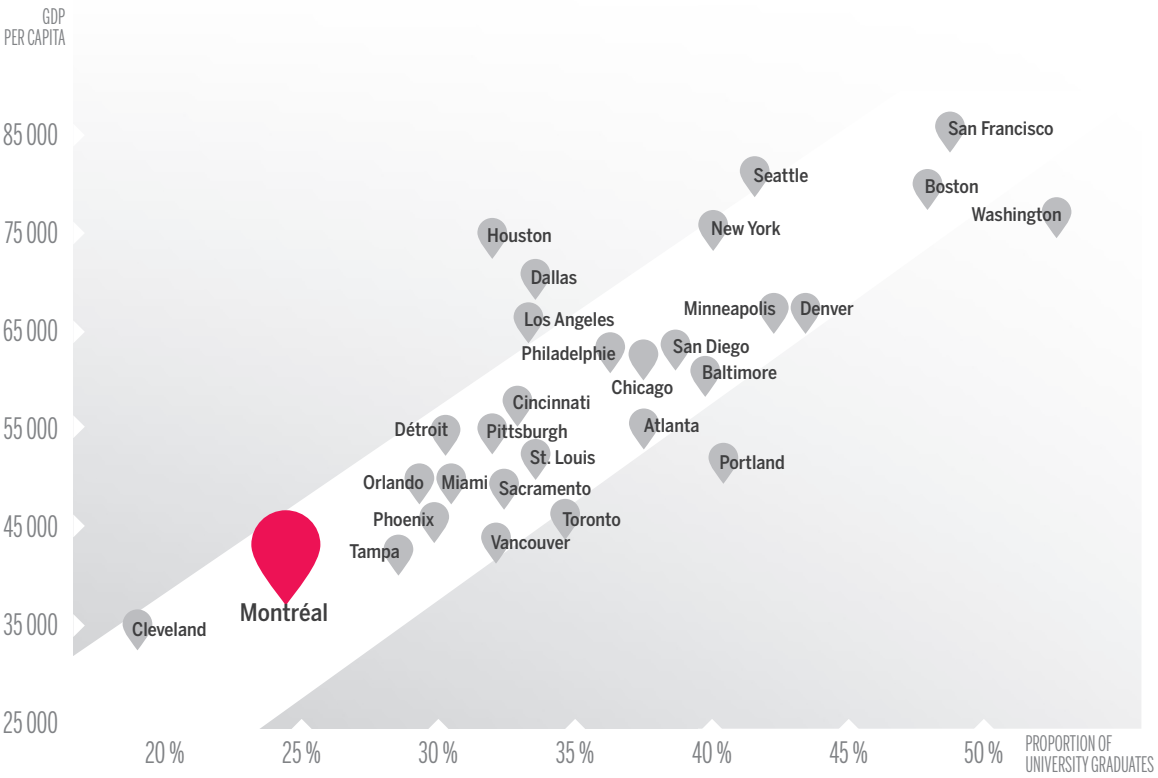
Sources: Statistics Canada, KPMG analysis.

2 The employment rate corresponds to the working population (or the employed population) as a percentage of the population age 15 and older, while the unemployment rate corresponds to the number of unemployed expressed as a percentage of the active population.

1.1.3. A positive correlation between the prosperity of metropolitan areas and the proportion of university graduates

Economic prosperity depends on the strength and size of businesses and industries. But having highly skilled labour is essential to the development of those businesses and industries, particularly those with high added value. It is therefore no surprise that metropolitan areas with the highest GDP per capita (i.e. where productivity or wealth per capita are higher) are also those where the level of education is higher (see Figure 4). While the presence of university graduates is not sufficient in and of itself, it is nevertheless necessary to the emergence and growth of sectors of activity that help increase wealth in metropolitan areas.

FIGURE 4
GDP per capita and share of university graduates among those 25 years and older
2014, in US dollars and as a percentage



Sources: Data on the proportion of university graduates among those 25 and older: U.S. Census Bureau, American Community Survey, Statistics Canada. Data on GDP per capita: The Conference Board of Canada, Statistics Canada, U.S. Bureau of Economic Analysis; KPMG analysis.

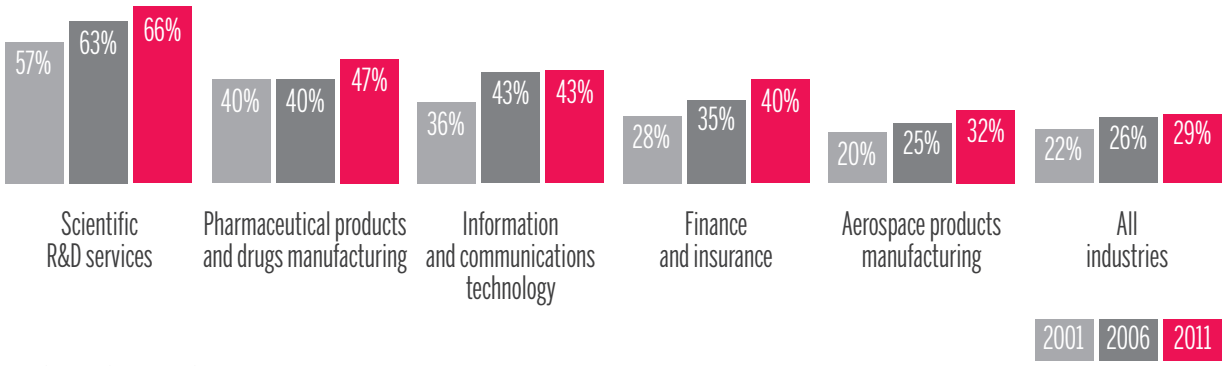
1.1.4. Universities: a source of skilled labour for Greater Montréal's leading-edge sectors

Universities help train skilled labour that fuels Greater Montréal's knowledge economy, stimulating the growth and performance of key local economic sectors. The importance of skilled labour and university graduates for value-added industries can be seen in leading-edge sectors in Greater Montréal, whether in terms of their weight in employment or their importance in attracting foreign investment.

Greater Montréal's key sectors have a high proportion of jobs that require a university degree. This is the case for scientific research and development (66% of jobs in 2011), pharmaceutical products and drugs manufacturing (47% of jobs), information and communication technologies (43% of jobs) and finance and insurance (40% of jobs). In all industries in Québec in 2011, 29% of jobs were held by university graduates.

Furthermore, the proportion of university graduates has been growing constantly in all sectors since 2001. In Greater Montréal industries, the proportion of jobs held by university graduates grew from 22% in 2001 to 29% in 2011.

FIGURE 5
Proportion of jobs held by university graduates, selected industries
2001, 2006 and 2011, CMA of Montréal



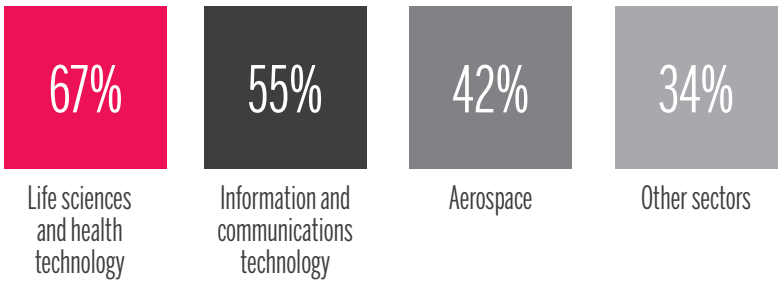
Sources: Statistics Canada, KPMG analysis.

Having highly skilled labour also makes Montréal attractive to foreign investors. When surveyed as to why they chose Montréal, 49% of foreign investors indicated the presence of highly skilled labour as one of the main factors in their decision, right after access to markets (see Table 1). This factor is particularly important for the life sciences and health technologies (LSHT) as well as for information and communication technologies (ICT) (see Figure 6). The skilled labour pool is a key factor for the international competitiveness of Montréal's leading-edge sectors.

TABLE 1
Factors promoting Greater Montréal's attractiveness for direct foreign investment
2007-2015, n=171, Montréal

	FACTOR	% OF BUSINESSES SURVEYED
1.	Access to markets	50%
2.	Presence of skilled labour*	49%
3.	Competitiveness (costs, labour, etc.)	48%
4.	Cluster effect	41%
5.	Financial aid	28%
6.	Incentives to businesses	15%
7.	Access to resources	14%

FIGURE 6
Proportion of businesses that indicated the availability of skilled labour *as a decision factor in their direct foreign investment, by sector
2007-2015, n=171, Montréal



* Includes the presence of universities.

Sources: Montreal International, KPMG analysis.

1.1.5. Innovative programs that reflect the reality of Greater Montréal's leading-edge sectors

There are 11 universities in Greater Montréal that offer a wide range of programs that meet the needs of the labour market in every sphere of society.

Many disciplines and programs are designed to provide skilled labour for Greater Montréal's key industries, including the aerospace, ICT and LSHT sectors. These programs keep being updated to reflect the needs of the job market. Industries can even play an active role in developing and updating these programs, through surveys and roundtables. They have direct insight into changes in the field and can testify to evolving needs in real time. Table 2 presents examples of programs developed or updated in partnership with industry.

TABLE 2
Examples of university programs in key Greater Montréal sectors

	EXAMPLES OF PROGRAMS DEVELOPED IN PARTNERSHIP WITH INDUSTRY
AEROSPACE	**Diploma in Aviation Management** – McGill University, in cooperation with the OACI **Partners :** several airlines
	Masters in Aerospace Engineering – McGill University, Concordia University, École Polytechnique, École de technologie supérieure, Université de Sherbrooke and Université Laval **Partners :** 13 Greater Montréal aerospace companies
ICT*	**Certificate in Cyberfraud, Investigation and Network Security** – École Polytechnique **Partners :** Desjardins, Deloitte, Morgan Stanley
	PERSWADE program (Pervasive and Smart Wireless Applications for the Digital Economy) – Various universities **Partners :** Cogeco, Ericsson Canada, Focus Microwaves, Industry Canada, Institut de recherche d'Hydro-Québec, InterDigital Canada, MDA, Nutaq and UltraTCS
LSHT**	**Short Graduate Program in Improving the Performance of Health Care and Social Services System Processes** – HEC Montréal **Partners :** ministère de la Santé et des Services sociaux, Agence de la santé et des services sociaux de Montréal

* Information and communication technologies.
** Life sciences and health technologies.

Sources: Regroupement des universités de la région de Montréal, KPMG analysis.

Other university programs give professionals and managers new skills to deal with the challenges facing cities. This is the case for UQÀM's graduate diploma in significant risk management. This interdisciplinary course focuses on risk prevention and management related to civil security, including attacks, epidemics and natural disasters.

Some programs take new approaches to offer students an innovative experience. This is the case for the master's level Surgical Innovation program, a joint offering from three universities and an initiative of the Concordia University MBA program (see Box 1).

BOX 1
EXAMPLES OF INNOVATIVE PROGRAMS

Masters in Surgical innovation

École de technologie supérieure, in partnership with McGill University's Department of Surgery and Concordia University's John Molson School of Business

This program gives students the skills to work on multidisciplinary teams to design innovative medical solutions that meet needs in health care.

Unique in Canada, this program was inspired by the biodesign program at Stanford University, which is internationally recognized for its approach and many successes developing and marketing new technologies in the biotech sector. Multidisciplinary teams made up of students in surgery, engineering and business administration evaluate needs during hospital visits. Together they choose a technical problem that can be solved by developing an innovative and commercially viable technology.

Trade Facilitation Office (TFO) Canada MBA Export Market Studies

Concordia University, in partnership with the Trade Facilitation Office

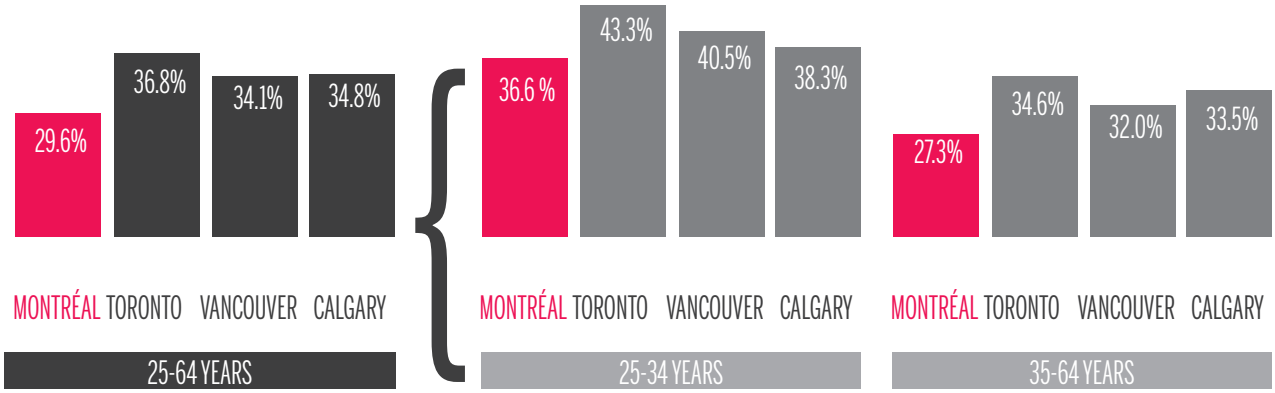
As part of an initiative that encourages community involvement among students, Concordia University offers MBA students the chance, through internships, to conduct a market study for a small business in a developing country that wants to export its products. Adapted to the client's targeted export products, the study includes an analysis of the Canadian import market and a custom market penetration strategy. Since 2010, some 20 students have completed eight internships with exporters in Bolivia, Ecuador, Indonesia, Peru, Guatemala and Salvador.

Sources: Regroupement des universités de la région de Montréal, KPMG analysis.

1.1.6. More effort required for Montréal to catch up to graduation rates in other Canadian cities

While Greater Montréal has gained a great deal of ground in terms of university graduates in the past 20 years, the city still lags other North American metropolitan areas. In 2011, the proportion of the population of Greater Montréal age 25 to 64 with a university degree was 29.6%. However, a more in-depth analysis by age group shows that the proportion of university graduates among the youngest cohort, age 25 to 34, was 36.6%, almost 10 percent higher than those 35 to 64 (27.3%). In spite of this notable increase, the proportion of university graduates in the CMA of Montréal still trails that in the CMA[3] of Toronto, Vancouver and Calgary.

GRAPHIQUE 7
Percentage of the population with a university degree, by age group and census metropolitan area
2011, as a percentage



Sources: Statistics Canada, KPMG analysis.

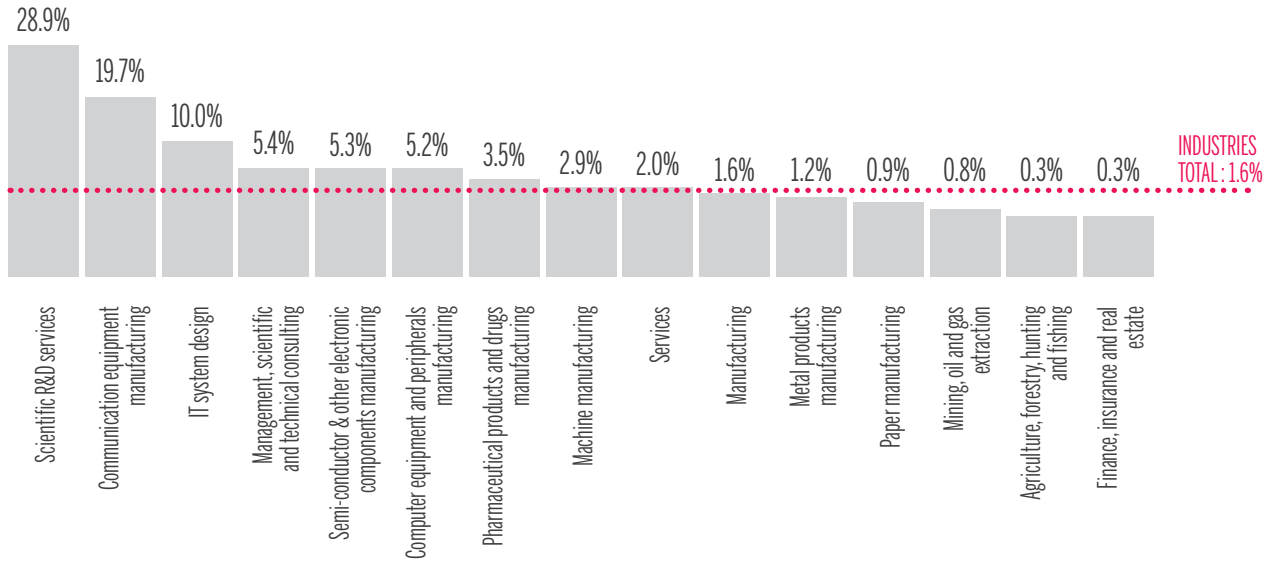
3 Census metropolitan area.

1.2. THE ESSENTIAL CONTRIBUTION OF UNIVERSITIES TO RESEARCH AND DEVELOPMENT

1.2.1 Research: the performance driver for most key sectors in Greater Montréal

While innovation is important for the economy as a whole, it is particularly central to the business model for key sectors of Greater Montréal. These sectors depend on R&D to create or improve products and reduce costs to remain competitive. They are drivers of wealth creation because of their direct economic benefits, but also through the emulation effect, i.e., their ability to influence and stimulate innovation in other sectors of activity.

FIGURE 8
Ratio of intramural R&D expenditures by businesses to revenue, selected sectors of activity
2013, Canada

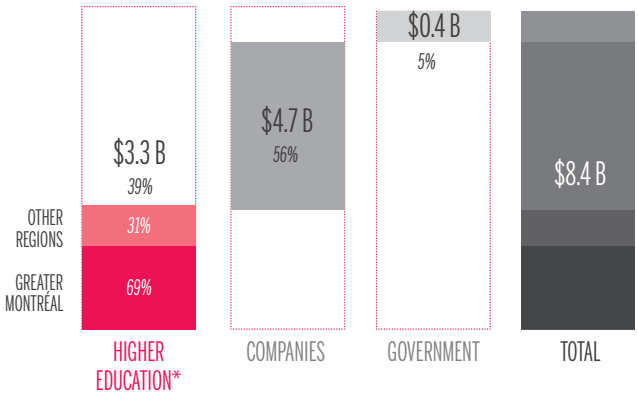


N.B.: Intramural expenditures refer to expenditures within companies. The information is not available for the aerospace products and parts manufacturing industry.

Sources: Statistics Canada, KPMG analysis.

1.2.2 ALMOST 40% OF ALL R&D IN QUÉBEC CONDUCTED BY UNIVERSITIES

FIGURE 9
R&D expenditures in Québec by sector
2013, in billions of dollars and as a percentage of total intramural spending



N.B.: Intramural spending refers to expenses in different sectors. The breakdown between Greater Montréal and other regions is based on data from the CAUBO database.

Sources: Institut de la statistique du Québec, KPMG analysis.

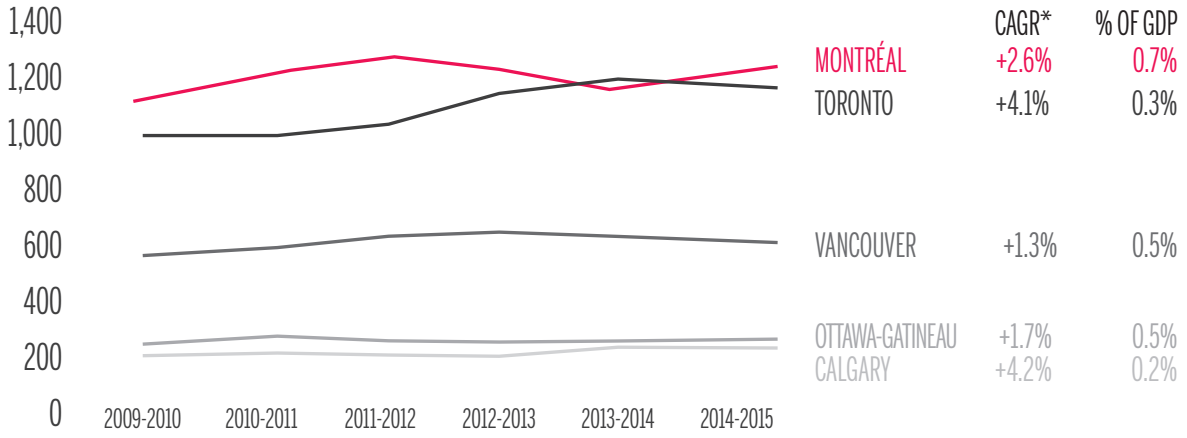
Because of their significant contribution to research and development, universities have become an important part of the innovation systems of advanced economies and their leading-edge sectors. In 2013, research and development spending totalled $8.4 billion in Québec (see Figure 9). Almost 40% of this spending was by universities, and 69% by universities and university hospitals in Greater Montréal.

Furthermore, Greater Montréal leads other major Canadian regions in university research spending, particularly in terms of R&D intensity (as measured by the ratio of R&D spending to GDP in the region). In 2014-15, $1.2 billion was devoted to university research in Greater Montréal, or 0.7% of GDP[4] (see Figure 10). By comparison, Vancouver and Ottawa-Gatineau both show intensity of 0.5%, whereas Toronto's is 0.3%. Only one Québec company can rival universities in R&D: Bombardier, with total spending of almost $2.2 billion in 2013-14.[5]

4 R&D data from the Institut de la statistique du Québec and universities cannot be reconciled because of differences in methodology related to professors' salaries.

5 Source: Research Infosource.

FIGURE 10
Research by the 50 largest universities, by CMA
From 2009-2010 to 2014-2015, in millions of dollars



* The compound annual growth rate (CAGR) is the average annual variation for the period.

Sources: Research Infosource Inc., the Conference Board of Canada, Statistics Canada, KPMG analysis.

1.2.3 Technology transfer: driver of corporate innovation

Universities can support innovation in local companies, not only by executing research contracts based on corporate needs and providing access to properly trained research personnel, but also through a system for promoting internal research conducted by university researchers. Through technology transfer, universities in Greater Montréal also play a fundamental role in corporate innovation. These transfers occur at two levels: by creating new companies that emerge from university discoveries and by granting licence options to existing or newly created companies (existing or newly created).

From 2010 to 2014, 21 companies were started from research discoveries by universities in Greater Montréal; there have been 88 such start-ups since 2000 (see Figure 11). Furthermore, research by universities in Greater Montréal leads to many new licences and options every year. From 2010 to 2014, 271 options and licences were executed by industry, and, in parallel, universities drew $27.6 million in revenue from these agreements (see Figure 12). Since 2000, this revenue has totalled $83.9 million. This figure is a lower limit, because it was compiled from a voluntary survey of universities.

FIGURE 11
Number of businesses created (start-ups), selected universities in Greater Montréal*
2000 to 2014, Montréal

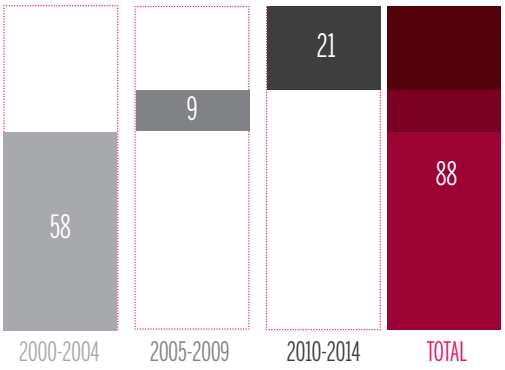
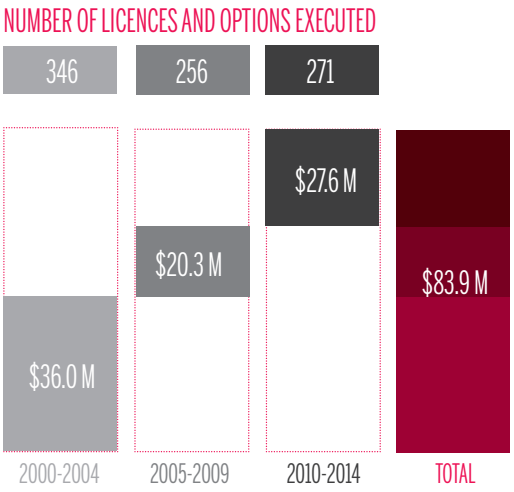


FIGURE 12
Revenue from options and licences executed, selected universities in Greater Montréal*
2000 to 2014, Montréal



* Only Université de Montréal, McGill University, École de technologie supérieure and Université de Sherbrooke regularly take part in the survey. The Institut de recherches cliniques de Montréal and Concordia University have also taken part in the survey in certain years.

Sources: Association of University Technology Managers (AUTM), KPMG analysis.

Table 3 presents examples of partnerships between universities and businesses or organizations as part of broader research projects and initiatives.

TABLE 3
Examples of partnerships between universities and businesses or organizations

PROJECT NAME	DESCRIPTION	PARTNERS
AÉROÉTS	The AÉROÉTS group represents, promotes and integrates École de technologie supérieure (ÉTS) teaching and research activities in aerospace. Over 50 professors are associated with it, in addition to over 70 sector partners. Some 90 research projects have been carried out or are under way. The group promotes mobilization and discussion among professors, researchers and students interested in the field and helps establish strategic national and international partnerships.	**ÉTS** **McGill University** **Over 70 sector partners**
Centre d'apprentissage des attitudes et habiletés cliniques	The Centre d'apprentissage des attitudes et habiletés cliniques (clinical skills learning centre) was created to combine experience from the Université de Montréal's Faculty of Medicine and CAE's know-how in simulation-based training. The two groups' joint efforts made it possible to create educational and technology tools along with service-based solutions that increase the safety and effectiveness of patient care. The centre hosts over 1,000 interns every month, whether students in medicine or health care practitioners.	**Université de Montréal** **CAE Healthcare**
Research Chair in Waste Recovery	This chair's mission is to develop, integrate and transfer knowledge to optimize strategies for managing and recovering waste in communities to meet their current and future needs, from the perspective of a circular economy. To fulfill its mandate, the chair has access to the treatment infrastructures of the Urban Agglomeration of Montréal, particularly the domestic waste pretreatment centre in Montréal East, a full-scale lab.	**École Polytechnique** **Ville de Montréal**
Automatic classification of knee movement data	The purpose of this research project is to develop an automatic kinematic data classification system that will be used to implement a new diagnostic technology for knee pathologies. This diagnostic tool will be integrated to the KneeKGs knee movement analysis system developed by the orthopaedics and imaging research laboratory and licensed to Emovi.	**TÉLUQ** **ÉTS** **NSERC*** **Emovi**
Design of a system to integrate bikes to different types of vehicles	Researchers from the Université du Québec à Montréal's École de Design are working with Bombardier Transportation Canada Inc. to design a bike transport system that can adapt to a manufacturer's different modes of transportation. The project is meant to develop a safe, practical and economical system that allows cyclists to take bikes on a range of vehicles, including subway cars and trains. The intention is to improve the integration of other modes of travel and promote the use of public transit.	**UQAM** **Bombardier Transport Canada inc.**
Creation of an enzyme supplement for pork and poultry	Concordia University has formed a partnership with Elanco, an American company in the field of animal health, as part of an effort to improve the diet of pork and poultry by creating a next-generation enzyme supplement. The products developed as part of the project should help improve the feed efficiency and thereby increase producers' profit margins.	**Concordia University** **Elanco**

Héritage	The project examines the issue of keeping the knowledge of future aerospace retirees within aerospace businesses. Intergenerational knowledge transfer is important in aerospace and in many other sectors in Québec that face the same challenge.	**HEC Montréal** **Bombardier** **AéroMontréal** **Emploi-Québec** **Héroux Devtek, Pratt & Whitney**
Introduction of the Centre d'évaluation des compétences de gestion and development of a training program	In partnership with the Ville de Montréal, the ENAP has created the Centre d'évaluation des compétences de gestion (management skills evaluation centre). The centre's mission is to build on the management skills of Ville de Montréal executives by providing essential information on finding and selecting the best candidates for management. The partners have also developed and deployed a training program to increase the management skills of the some 1,700 Ville de Montréal executives.	**ENAP** **Ville de Montréal**
Pôle d'intelligence	Bringing together a pool of multidisciplinary professors and researchers, the Pôle d'intelligence d'entreprise's (business intelligence centre) objective is to make university expertise available to businesses, institutions and other economic players in Québec to search for intelligence solutions that address complex problems and increase competitiveness. The centre stimulates training and scientific research in intelligence, while creating a network suited to Québec's small and large businesses.	**Université de Sherbrooke, Longueuil Campus** **Many partners**
Project on mechanisms for dynamically adapting the quality of communication media	This project studies mechanisms of dynamic adaptation in the quality of communication media, voice and video, in a range of communication conditions that reflect practical usage scenarios, on third- and fourth-generation networks and Wi-Fi. The ultimate goal is to define rules for automating the choice of mechanism based on usage conditions, network status and the mobile device's processing capacity.	**INRS** **Summit Tech Multimedia Communications Inc.**
Quartier de l'innovation	Under the leadership of universities, located in the southern part of downtown Montréal, the Quartier de l'innovation's goal is to create the conditions for developing a quality urban district that rallies a creative, engaged community and promotes an innovative and entrepreneurial culture with four areas of focus (industrial, training and research, social and cultural, and urban).	**McGill** **ÉTS** **Concordia** **Government and private partners**
Technoculture, Art and Games (TAG)	TAG is an interdisciplinary centre for research and creation in video game studies, design, digital culture and interactive art. TAG brings together researchers, artists, designers, engineers and students from every department of Concordia University and other universities, as well as representatives of the games industry, media arts and community groups.	**Concordia University** **Many partners**

* Natural Sciences and Engineering Research Council of Canada.

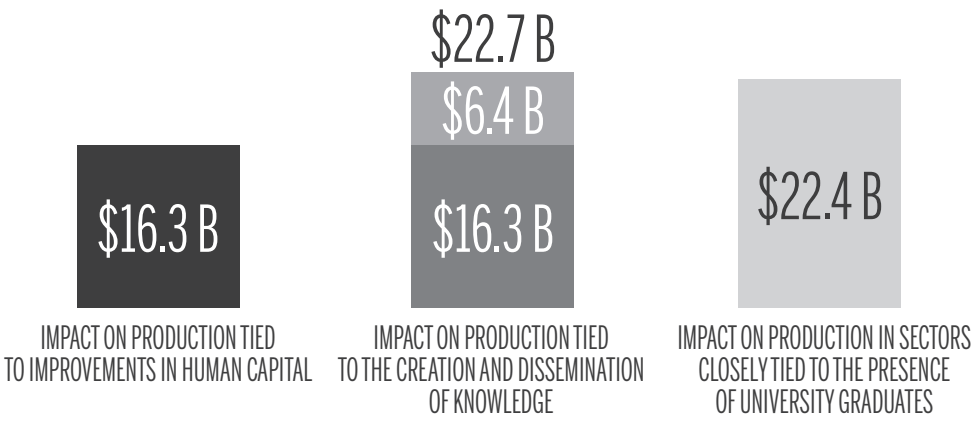
Sources: Regroupement des universités de la région de Montréal, KPMG analysis.

1.3. A MAJOR CONTRIBUTION TO THE PRODUCTION AND WEALTH OF GREATER MONTRÉAL

By helping increase human capital through the knowledge passed on to their graduates and fostering knowledge creation and dissemination, universities increase a society's productivity. This is one of their most important and distinctive contributions.

When measured in additional remuneration, the contribution of university graduates to Greater Montréal's GDP attributable to human capital was an estimated $16.3 billion for 2014-2015 (8.7% of the GDP of Greater Montréal). In addition to the impact related to knowledge creation and dissemination, estimated based on the contribution of multifactor productivity[6] to GDP growth, the contribution of university graduates is $22.7 billion (12.1% of the GDP of Greater Montréal). The methodology is outlined in Appendix I.

FIGURE 13
Contribution of university graduates in Greater Montréal to the increase in production within the territory
2014, Montréal area



% OF GREATER MONTRÉAL'S GDP	8.7%	12.1%	12.0%

Sources: Regroupement des universités de la région de Montréal, Statistics Canada, KPMG analysis.

De plus, de nombreux secteurs économiques de la région métropolitaine de Montréal sont étroitement liés à la présence d'un bassin important de diplômés universitaires. Sans ces diplômés, ces secteurs ne pourraient sans doute pas assurer leur compétitivité. C'est le cas notamment des secteurs de la fabrication de produits pharmaceutiques et de médicaments, de la conception de systèmes informatiques, des services juridiques, de l'architecture, de la comptabilité, des services-conseils ainsi que de différents sous-secteurs de la finance et de l'assurance. En considérant uniquement les secteurs détenant 40 % ou plus de diplômés que la moyenne des secteurs de la grande région de Montréal[7], l'impact sur la production des secteurs étroitement liés à la présence de diplômés universitaires est évalué à 22,4 milliards de dollars (12 % du PIB de la région de Montréal).

6 Multifactor productivity is the increase in wealth in an economy not explained by capital and labour factors of production.

7 On average, 29% of jobs in Greater Montréal are held by university graduates. To calculate the impact of production from sectors closely tied to the presence of university graduates, only sectors in which over 40% of jobs are held by university graduates (or 40% more than the average for sectors) have been taken into account. The public sector was excluded.

THE ECONOMIC CONTRIBUTION OF UNIVERSITIES IN GREATER MONTRÉAL

University students: an important presence in Greater Montréal

- Greater Montréal has 11 universities, representing more than 155,000 students and 53,000 degrees granted in 2014-2015.
- Montréal has seen a significant increase in the number of international students in recent years.
- Given our economic and demographic challenges, it is important to attract and retain international students and students from other parts of Canada.
- We should not forget expenditures of $540 million by students from outside Québec, resulting in close to 3,500 additional jobs in Greater Montréal.

Universities: leading-edge centres that are like the other major technology sectors in the region

- Spending by universities in Greater Montréal totalled $4.3 billion in 2013-2014, producing $3.5 billion in added value.
- With 41,475 direct jobs, universities compare well to major clusters in Greater Montréal.
- Universities are major exporters of services.

A profitable investment for society and individuals

- A university degree is a profitable investment for individuals, societies and governments, particularly since social costs are significantly reduced the higher the level of education.

2.1. UNIVERSITY STUDENTS: AN IMPORTANT PRESENCE IN GREATER MONTRÉAL

The size of the university community helps make the city dynamic, and this is nothing new. The 11 universities in the Montréal metropolitan area were founded over the course of 200 years and are landmarks of Montréal's history. The first university to open its doors was McGill University, in 1821. Then came Loyola College (1848), which merged with Sir George Williams University to create Concordia University (1974), École Polytechnique (1873), Université de Montréal (1878, but at the time was known as Université Laval à Montréal), and the HECs (1907). Then, with the educational reform and the Parent report in the 1960s, UQÀM, the ENAP, the INRS (1969) and the ÉTS (1974) opened their doors. The picture was completed in 1990 with the opening of the Université de Sherbrooke's Longueuil Campus, and in 1992, the inauguration of the TÉLUQ.

FIGURE 14
Timeline of the foundation of the 11 universities in Greater Montréal

Sources: University websites.

This section first presents a statistical overview of the student population of Greater Montréal and follows with the economic benefits of university spending, as well as expenditures by students from outside Québec. It concludes by presenting the contribution of universities for individuals, governments and society.

2.1.1. Over 155,000 university students in Greater Montréal

In 2015, the 11 universities[8] in Greater Montréal had more than 155,000 students (full time equivalent), or 65% of Québec's student population. The student population has not stopped growing, having seen an annual increase of 2.8% since 2009-2010 (see Figure 15). In comparison, the population of 20 to 29 year olds grew 1.1% in the RCM of Montréal from 2009 to 2014.[9]

In 2014-2015, 53,533 university degrees were awarded,[10] including 23,901 (45%) bachelor's degrees, 7,847 (15%) master's degrees and 1,410 (3%) doctoral degrees (see details by degree in appendix II). Rather than entering the job market right away, more and more students are deciding to continue their education in graduate programs. The number of graduate students has shown more sustained growth, reaching an annual 3.9% between 2009-2010 and 2014-2015. Graduate studies offer the promise of higher income than undergraduate studies, because the job market has increasingly skilled and specialized jobs, as shown in section 1.

FIGURE 15
Number of students by cycle of study*
Full time equivalent, 2009-2010 and 2014-2015

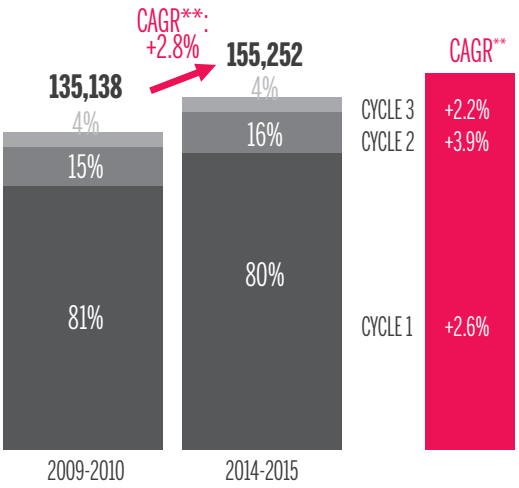
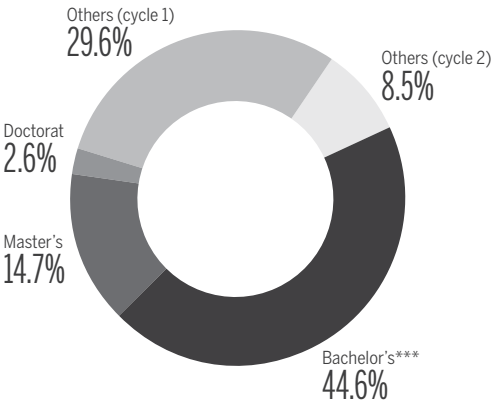


FIGURE 16
Number of degrees granted by level
2014-2015



* Excludes self-financed students.
** The compound annual growth rate (CAGR) represents the average annual variation for the period.
*** Includes bachelor's degrees by accumulating certificates.

Sources: Gestion des données sur l'effectif universitaire (GDEU), KPMG analysis.

This pool of students contributes to the vitality of Greater Montréal. Having this population of young people is important to Montréal's cultural, community and social vitality. It is one of the things that fuels the city's reputation for quality of life.

8 Including four (4) university campuses.

9 Source: Institut de la statistique du Québec.

10 Includes, in addition to programs leading to a degree, certificates and other diplomas from short programs.

2.1.2. Significant increase in the number of international students in Greater Montréal in recent years

According to the 2016 QS Best Student Cities ranking, Greater Montréal is the best place to study in North America and is ranked seventh globally.[11] For the first time, the city was ahead of Boston in the ranking. It is therefore no surprise that Montréal's appeal with international students has increased. Since 2009-2010, the number of international students grew by 43%, from 15,770 to 22,594. However, we should note that the number of students from the rest of Canada dropped slightly over the same period (-4%) (see Figure 17). All cycles combined, international students represented 15% of students in universities in Greater Montréal in 2014-2015 and are even more present in master's and doctoral programs, where they represent respectively 21% and 40% of the student body (see Figure 18).

FIGURE 17
Number of students by origin
Full-time equivalent, 2009-2010 and 2014-2015

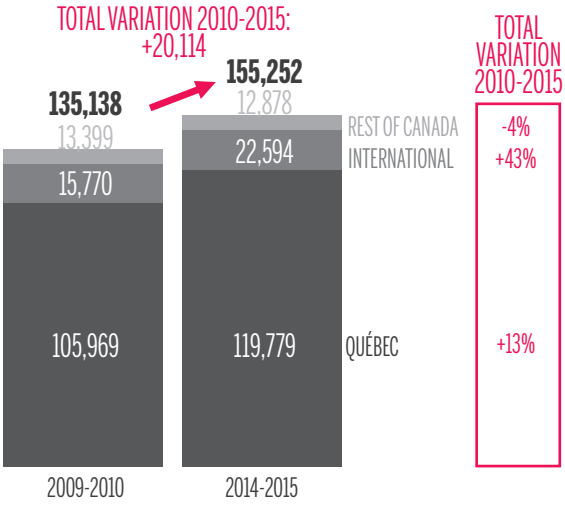
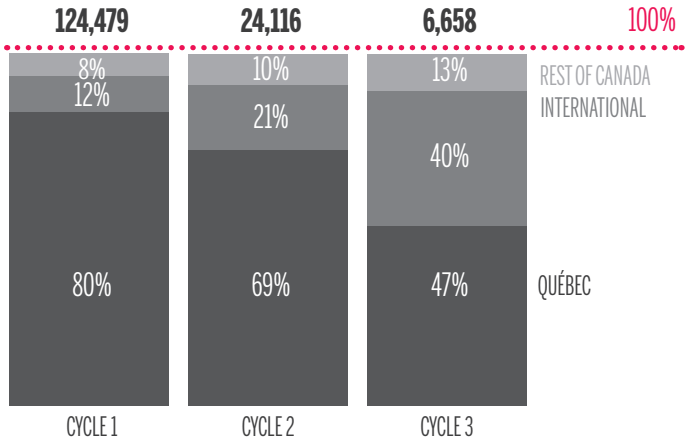


FIGURE 18
Number of students by origin and cycle of studies
Full-time equivalent, 2014-2015



Sources: Gestion des données sur l'effectif universitaire (GDEU), KPMG analysis.

11 Evaluation criteria include the relative size of the student population, safety, the presence of quality local and multinational employers and the cost of living.

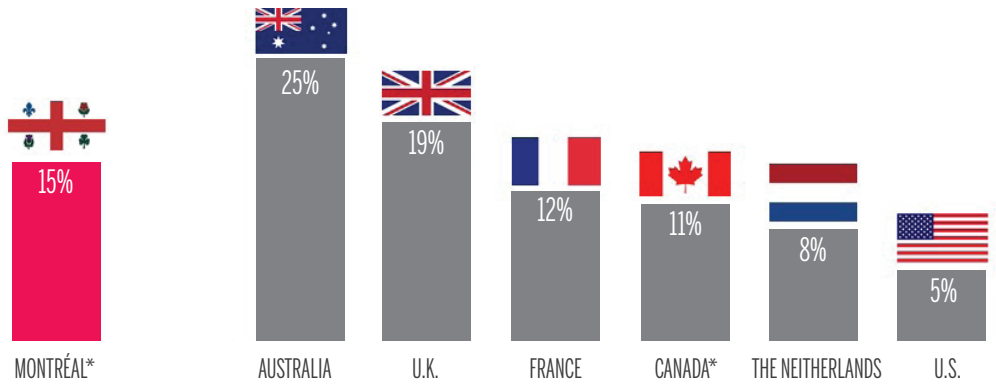
2.1.3. The importance of attracting and retaining international students in the face of economic and demographic challenges

For Québec, the influx of international students must be encouraged, and we need to better tap into their potential. As previously pointed out, increasing productivity and wealth per capita in Greater Montréal will require more and a higher proportion of university graduates. With Québec's demographics, it will be difficult to compete with other major metropolitan areas without attracting and retaining more international graduates or graduates from the rest of Canada. Universities must play a leading role in this.

University studies are one of the gateways for foreign talent, who move to the city of their choice to get a university degree, establish a circle of friends and a network of acquaintances and get their bearings. Integrating newcomers to Québec society and the job market goes much smoother if they know the environment and if their education is recognized. We should not be surprised that many regions, even countries, have adopted a range of measures to facilitate and promote an increase in international students. For example, Australia has made attracting international students a national priority.

In 2014-2015, 15% of the student population in Greater Montréal was made up of international students. The location of Montréal universities places them in the average nationally for large countries recognized for their universities (see Figure 20). But we can do better. For Montréal universities, this is in addition to students from the rest of Canada (8% of students), but their numbers have dropped, as pointed out above.

FIGURE 19
Proportion of international students in the total student population, higher education, selected countries
2014-2015 (except for the UK: 2013-2014 and the Netherlands: 2011-2012)

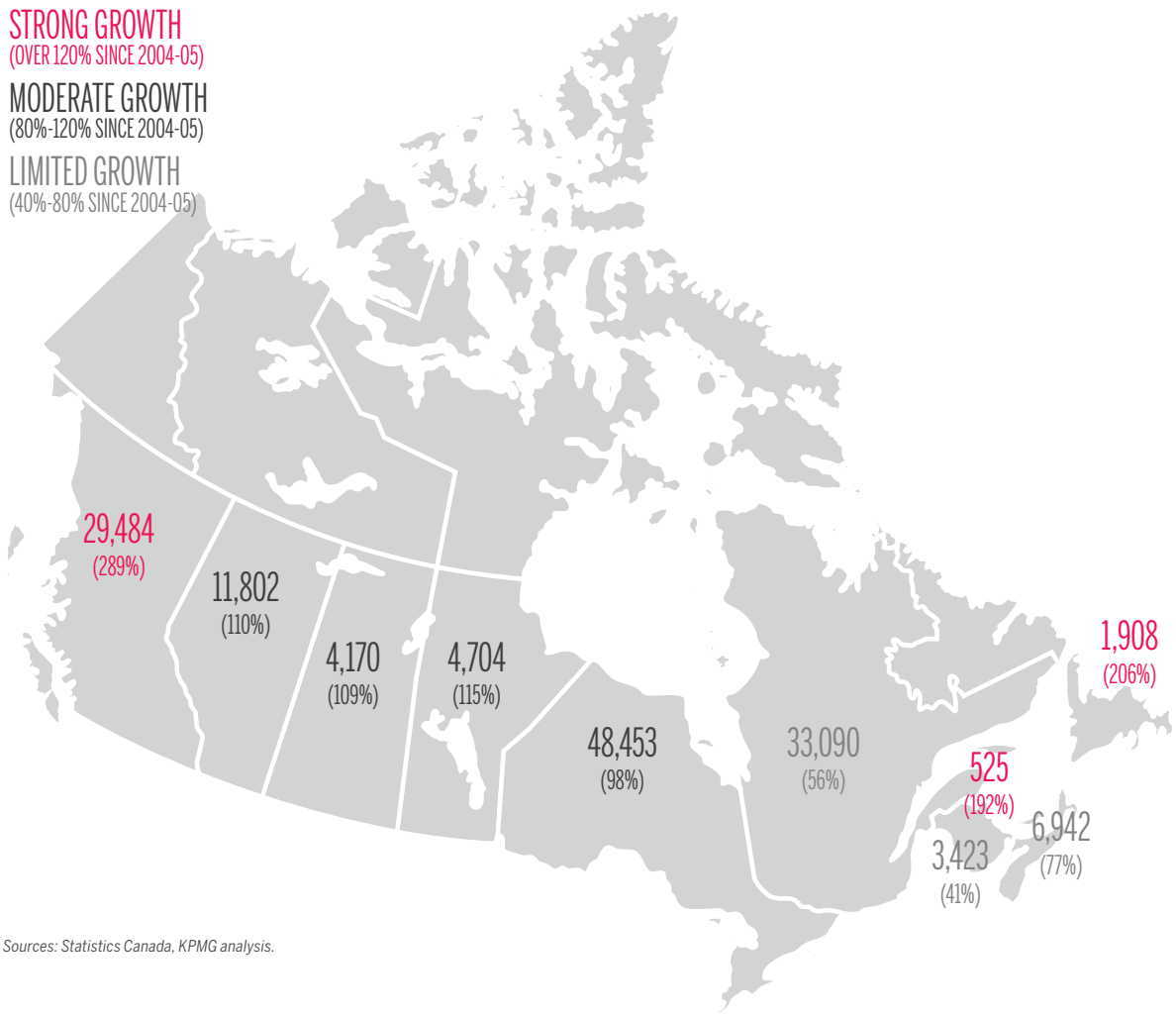


* Includes undergraduate and graduate students. Excludes colleges.

Sources: Gestion des données sur l'effectif universitaire (GDEU), Australia Department of Education and Training, Universities UK, Campus France, Statistics Canada, Study in Holland, Institute of International Education (U.S.), KPMG analysis.

Furthermore, in spite of recent growth, and as Figure 20 illustrates, Québec is losing ground compared with other major Canadian provinces, particularly British Columbia, where the number of international students increased 289% from 2004-2005 to 2013-2014, today totalling 29,484. In comparison, Québec has 33,090 international students, but the total increase was only 56% in the past 10 years, weaker growth than in the rest of Canada (except for New Brunswick).

FIGURE 20
International student population by province
2013-2014, in absolute numbers and total variation since 2004-2005 (in brackets)

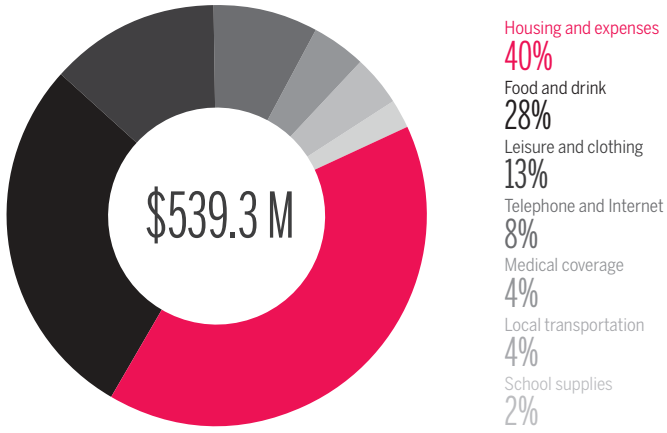


Sources: Statistics Canada, KPMG analysis.

2.1.4. Expenditures by students from outside Québec generates economic benefits in Greater Montréal

The presence of a large pool of students from outside Québec also generates spending within the province, representing an injection of cash into the economy.[12] This spending is notably in the form of tuition fees, which are higher than the fees for Québec students and contribute to the financing of universities.

FIGURE 21
Spending on goods and services by students from outside Québec who attend universities in Greater Montréal
2014-2015, excluding tuition fees



Source: KPMG analysis.

In addition to tuition fees, international students also contribute through the goods and services they purchase during their stay, whether for housing, food, school supplies or leisure. In 2014-2015, the 42,958 students[13] from outside Québec generated estimated expenditures of $539.3 million, or slightly over $12,500 per student (see Appendix III for assumptions). This spending includes mainly housing (40%), food (28%), clothing and leisure (13%) and communications (8%) (see Figure 21). As an example, expenditures by students from outside Québec were equal to around 20% of tourism spending in Greater Montréal.

These expenditures helped increase the metropolitan area's GDP by $367.4 million in 2014-2015. It also directly maintained 1,211 full-time equivalent (FTE) jobs and indirectly maintained 2,198 jobs in the Québec supply chain in question (see Appendix III for the methodology and Appendix IV for detailed results).

Spending by students from outside Québec also generates revenue for the Government of Québec. This is in the form of taxes on salaries and wages, sales tax and specific taxes, as well as Health Services Fund revenue. In total, expenditures generated $51.1 million in direct and indirect revenue related to taxes for the Government of Québec.

12 Spending by Québec students is not taken into account, because it would have occurred regardless of whether they pursued a university education.

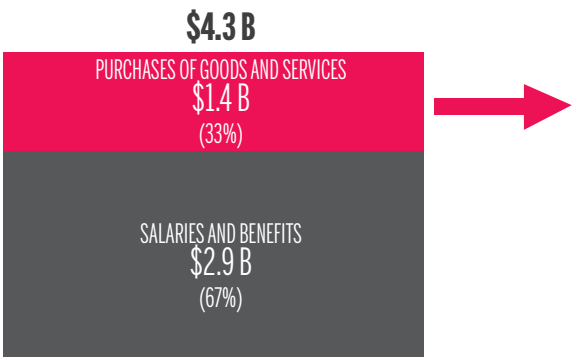
13 According to the number of registrations.

2.2. UNIVERSITIES: A LEADING-EDGE SECTOR LIKE OTHER IMPORTANT TECHNOLOGY SECTORS WITHIN THE REGION

2.2.1. Spending by universities in Greater Montréal totalled $4.3 billion in 2013-2014, generating added value of $3.5 billion

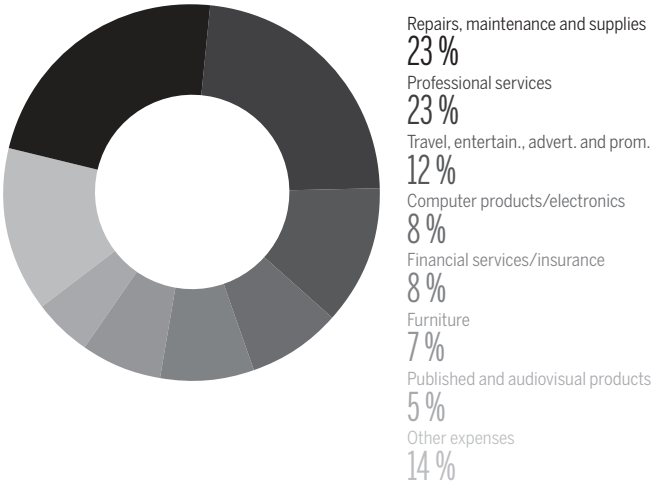
In 2013-2014, universities in Greater Montréal spent in the order of $4.3 billion, almost $2.9 billion of that in salaries and wages (including benefits).[14] The purchase of goods and services from Québec suppliers represented over $1.4 billion. Among the main purchases, we note repairs and maintenance (23%), professional services (23%), travel expenses, advertising and promotion (12%) and computer and electronic products (8%).

FIGURE 22
University spending by major category
2013-2014



Sources: CAUBO database, KPMG analysis.

FIGURE 23
Purchase of goods and services by major category
2013-2014



14 Includes R&D spending.

Total added value from university spending was $3.5 billion, which includes $2.5 billion in salaries and wages. The detailed results are presented in the following table.

TABLE 4
Economic impact of spending by universities in Greater Montréal – Impact on added value and jobs in Québec
2013-2014, in millions of dollars

	QUÉBEC		
	DIRECT EFFECTS	INDIRECT EFFECTS	TOTAL EFFECTS
Added value (in millions of dollars)	**2,857.0**	**693.4**	**3,550.4**
Pre-tax salaries and wages	2,132.4	351.8	2,484.2
Gross mixed income(1)	0.0	54.4	54.4
Other gross pre-tax income(2)	724.6	287.2	1,011.8

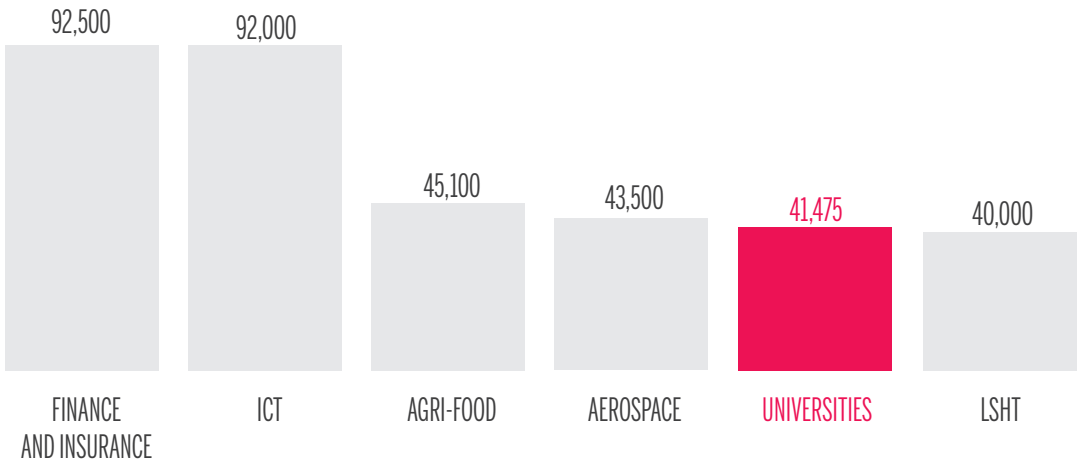
(1) Gross mixed income refers to the income of owners of unincorporated businesses (sole proprietorships).
(2) Other pre-tax income refers to benefits, profits, amortization, etc.

Source: KPMG estimates based on Institut de la statistique du Québec simulations.

2.2.2. With 41,475 direct jobs, universities compare favourably to other major clusters in Greater Montréal

With 41,475 full-time equivalent jobs in 2013-2014, universities are a major employer in Greater Montréal. Together, they compare in size to other important sectors in Greater Montréal, such as agri-food processing, aerospace and LSHT (see Figure 24). Beyond direct jobs, their spending has helped indirectly support 10,376 jobs with Québec suppliers.

FIGURE 24
Number of employees by major sector
2015, CMA of Montréal



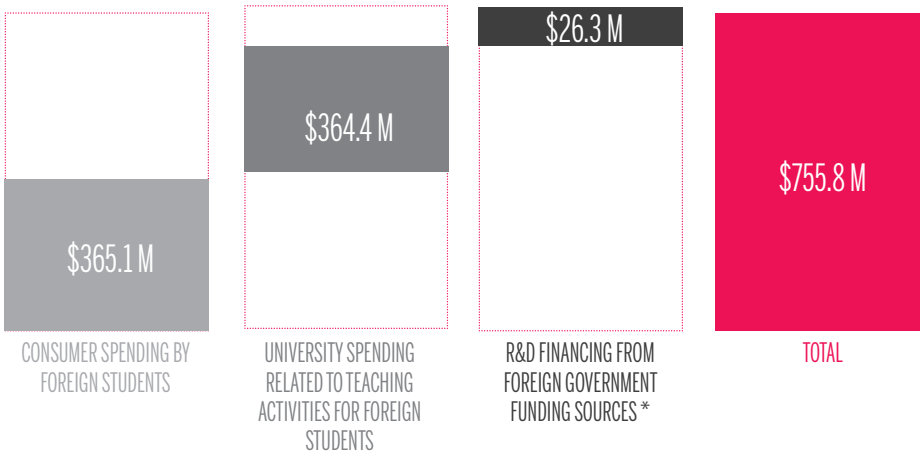
Sources: Montreal International, KPMG analysis.

2.2.3. Major exporters of services

Universities are similar to major exporters of services. First, consumer spending by international students generates purchases from suppliers, as well as an increase in teaching activities within universities themselves. Additionally, R&D financed by international partners creates an increase in research activities within universities. Together, in 2013-2014, these factors represented economic activity totalling $755.8 million.[15] If teaching services in Greater Montréal were considered a product, they would rank 23rd among the most exported products in Québec from a list of over 250 (see Figure 25).

Nationally, universities also attract research funding from the Government of Canada, which is spent locally. In 2013-2014, these funds totalled over $516.3 million, not taking into account spending by students from other Canadian provinces and the increase in teaching activities that this generates in Québec.

FIGURE 25
Estimated value of exports of teaching services
2013-2014, Montréal



* The data does not permit us to isolate foreign contributions from non-government sources.

Sources: CAUBO database, KPMG analysis.

15 Only foreign government financing was included ($26.3 million), because data on other sources of foreign financing is not available.

2.3. A PROFITABLE INVESTMENT FOR INDIVIDUALS, GOVERNMENTS AND SOCIETY

Since university graduates get skilled jobs, they have better working conditions. The average income of university graduates ($60,091 for those with a bachelor's degree and $75,414 for those with a master's or doctoral degree) was respectively 49% and 87% higher than that of college diploma (DEC) holders (see Figure 26).

In addition to the relative ease with which university graduates find jobs, higher employment income helps give bachelor's students an annual internal rate of return of 15.6% on the investment in their education (see details on methodology in Appendix V).[16] In other words, the investment students make in their undergraduate university studies is the equivalent of an investment with annual interest of 15.6%, for their entire working life.

Over the course of a working life, this represents additional revenue in the order of $300,000 compared with a DEC and $400,000 compared with a high school diploma (present value) (see Figure 27). Over the course of a working life, someone with a bachelor's degree will pay more than an additional $100,000 in taxes to the Government of Québec than a college graduate.[17]

FIGURE 26
Average income, before tax, according to highest degree obtained
2014, Québec

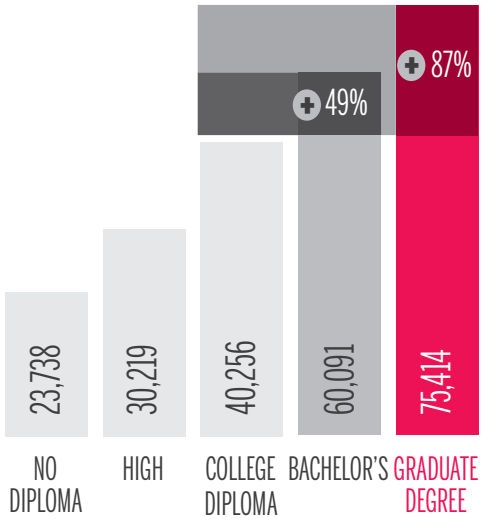
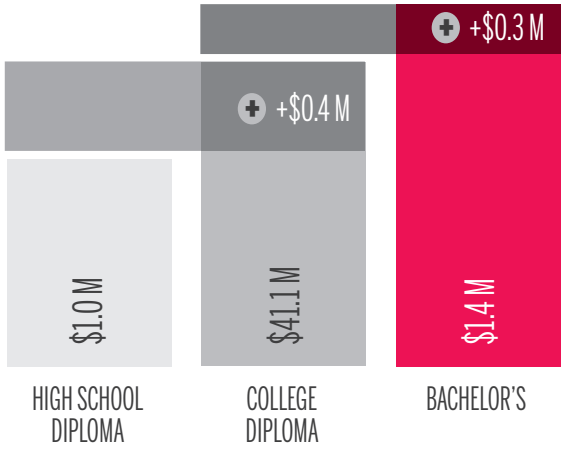


FIGURE 27
Present value of cumulative financial gain over the course of a working life
2014, Québec



Sources: Statistics Canada, KPMG analysis.

16 The internal rate of return (IRR) is a measure of the performance of capital invested in a university education from the point of view of the student. For the purposes of calculating the IRR, tuition fees, school supplies and the opportunity cost of delaying one's entry to the job market are taken into account. The IRR makes it possible to evaluate the decision to pursue university studies from a strictly financial point of view.

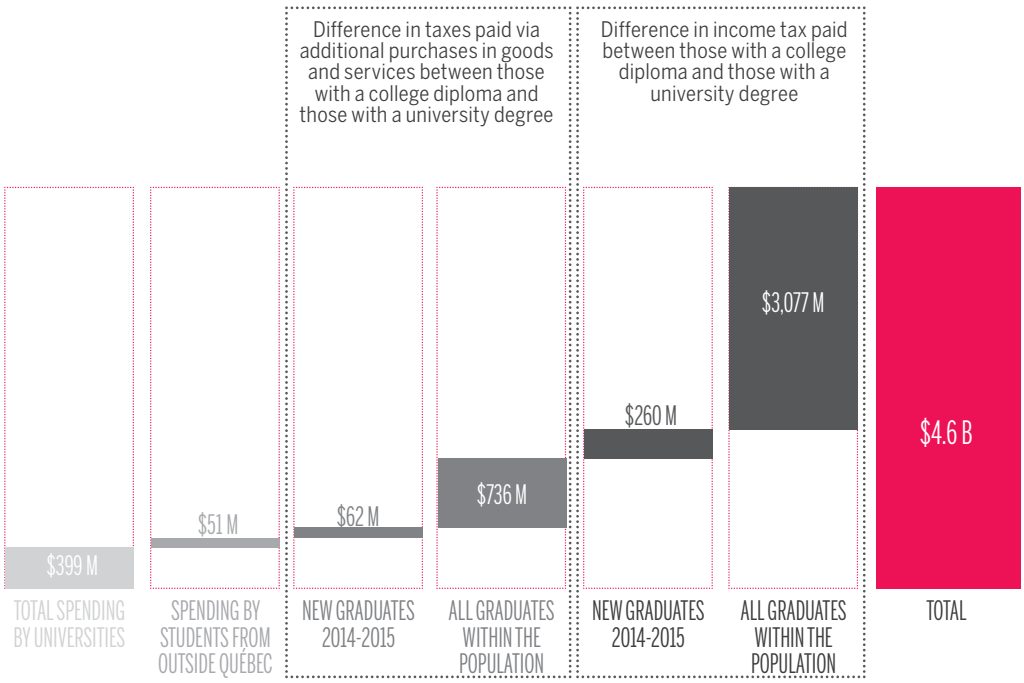
17 Present value, which includes income tax and sales and specific taxes.

In 2013-2014, the Government of Québec devoted a total of $1.8 billion to funding universities in Greater Montréal (which includes operations and research), while tax revenue from university expenditures and from the additional income of all university graduates in Greater Montréal was $4.6 billion. This amount includes tax revenue from university expenditures and spending by students from outside Québec. This is in addition to the two following factors.

- Taxes from additional consumer spending: The wage differential between college diploma holders and university degree holders will generate other income and sales tax through additional consumer spending.
- Income tax from the wage differential: The wage differential between college graduates and university graduates will generate additional income tax.

FIGURE 28
Government of Québec contribution to Greater Montréal universities
2013-2014,
in billions of dollars

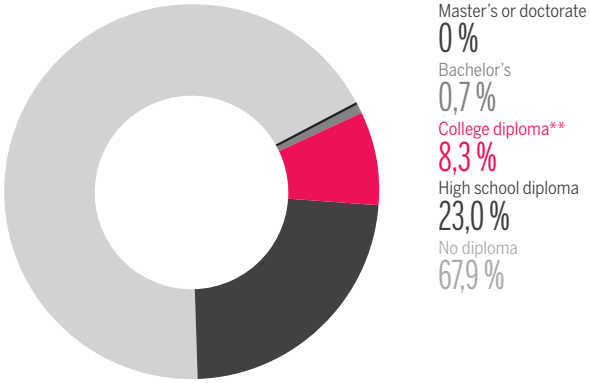
FIGURE 29
Additional tax revenue generated by universities and university graduates in Greater Montréal
2014-2015, in billions of dollars



Sources: CAUBO database, Institut de la statistique du Québec simulation, KPMG analysis.

FIGURE 30
Beneficiaries of last-resort financial assistance programs according to highest degree received*

December 2015



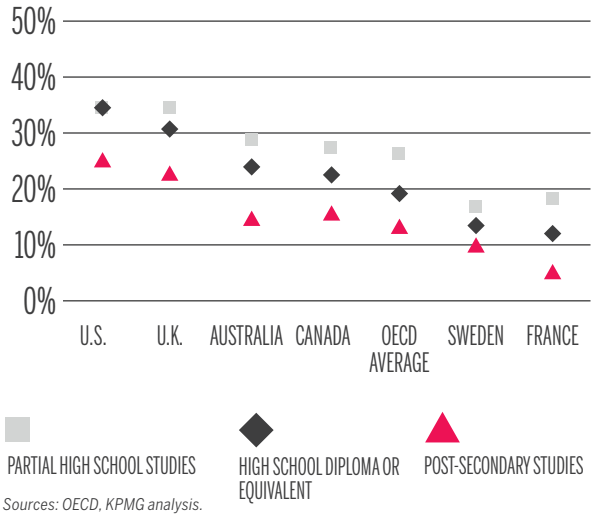
*Excludes beneficiairies whose degree is unknown. **Includes university certificates.

Sources: Ministère du Travail, de l'Emploi et de la Solidarité sociale, KPMG analysis.

This data does not take into account the impact of education on social costs to governments, which are difficult to quantify. Nevertheless, there is an inverse relationship between the level of education and recourse to social programs, in particular last-resort financial assistance programs (see Figure 30). Holders of university degrees represent only 0.7% of beneficiaries of this program, while they correspond to around 26%[18] of the population of 25-64 year olds in Québec. Furthermore, education plays a major preventive role in individual behaviour in terms of health, particularly by reducing the incidence of obesity and tobacco use among the population (see Figures 31 and 32).

FIGURE 31
Rate of obesity according to highest degree received, selected countries

2011



Sources: OECD, KPMG analysis.

FIGURE 32
Rate of tobacco use according to highest degree received, selected countries

2011

18 Source: Institut de la statistique du Québec, drawn from Statistics Canada.

UNIVERSITIES: MEMBERS ACTIVE IN THE COMMUNITY

Beyond their role of creating and disseminating knowledge and the spinoffs from their spending, students, professors and staff of universities participate in the life of their community, by giving their time and putting their skills at its disposal. Many initiatives are conducted in each of the universities in Greater Montréal, whether in the area of public health, culture, fighting poverty and exclusion, etc. This section provides a non-exhaustive overview of a few of these initiatives that support or lend vitality to communities in Greater Montréal.

- **Universities offer many services to communities.**
- **A number of initiatives have been developed to cultivate curiosity in young people, to prompt them to want to pursue their education.**
- **Communities in which universities operate enjoy a rich cultural and sports life.**
- **Through free online courses, universities promote universal access to knowledge.**

3.1. MANY SERVICES OFFERED TO COMMUNITIES

Firmly rooted in their environment, university students, professors and staff are full members of their community. They play an active role in improving the quality of life of their community, by offering a range of lost-cost and free services. These services meet a real need of communities, and often target a clientele with more limited financial resources.

Representing thousands of hours invested by students and professors, these services are in part offered within programs of study, which helps train students through hands-on cases in the field. They take different forms: legal clinics, tax clinics, nutrition advice, dental clinics, etc. They include L'extension, centre de soutien en pédagogie et en santé, which supports the development of disadvantaged children and helps their families by offering accessible education and health services. There is also the Clinique internationale de défense des droits humains, which offers free legal support to victims of human rights violations and to defenders of human rights around the world (see Box 2).

Other initiatives promote the integration of cultural communities. One of the significant examples of this resulted from a partnership between the TÉLUQ and the Institut MATCI,[19] which collaborates on short programs and courses for credits for students from cultural communities in Greater Montréal. One of the partnership agreements between the two organizations to keep young people in school and help them succeed academically provided over 700 people access to French and English language learning programs.

BOX 2

L'extension: centre de soutien en pédagogie et en santé (Université de Montréal)

Located in Parc-Extension, L'extension is run by an interdisciplinary team of teaching and health care professionals, who work together to ensure a comprehensive follow-up for children and their families.

Since its inauguration in 2014, L'extension has been offering remedial education services to students with learning disabilities and workshops to promote oral health, screening for vision problems and making parents and school workers aware of issues related to vision and oral health and learning disabilities.

Clinique internationale de défense des droits humains (UQAM)

Since it was founded in 2005, over 300 students have been trained at this clinic under the supervision of professors and lawyers, in every field of human rights, by contributing to actual defence cases, whether for the rights of migrants, women's rights, protection against sexual violence, rights of aboriginal peoples, the fight against torture or the protection of natural resources.
This is the first clinic for international human rights law in the Francophonie; it has served as a role model and contributed to the creation of many international law clinics around the world.

Source: Regroupement des universités de la région de Montréal.

19 The Institut MATCI is an institution authorized by Morocco's Ministère de l'Enseignement supérieur, de la Recherche scientifique et de la Formation des cadres to offer Canadian post-secondary and university training to its members.

3.2. INITIATIVES FOR YOUTH

The scope of action of universities, through their students and professors, even extends into primary and secondary schools. Certain initiatives introduced by students and professors are intended to cultivate curiosity among young people to prompt them to pursue their education. The Folie Technique initiative, the SEUR project and film training for young members of First Nations, presented in Table 5, show the involvement of universities in the community, particularly among youth.

Other initiatives target at-risk young people. For example, the Clinique d'intervention en enfance et adolescence, which opened its doors at the Université de Sherbrooke's Longueuil Campus in 2010, offers psychological evaluation, individual therapy for teens and children and family support. By facilitating access to mental health consultations for children and teens, the Université de Sherbrooke's Longueuil Campus psychology clinic offers families a great deal. Furthermore, the art that hangs on its walls comes from some 60 pieces created by primary and secondary students in the region.

Similarly, there is the study on the future of young people in foster care Québec and France conducted by the Canada Research Chair in Evaluating Public Actions Related to Young People and Vulnerable Populations, held by an ENAP professor. This is the first representative longitudinal study of young people leaving foster care in Canada. The study will contribute to knowledge acquisition by looking at the different care contexts to anticipate the transition to adult life among youth in foster care and possible futures.[20]

20 Source: École nationale d'administration publique.

TABLE 5
Examples of initiatives to raise awareness among young people

FOLIE TECHNIQUE

Folie Technique is a non-profit organization that opened its doors in 1991 at the initiative of Polytechnique Montréal engineering students.

Folie Technique's objective is to offer primary and secondary students a taste of the world of science and engineering and develop their self-confidence, regardless of where they live, their socioeconomic situation or their sex.

In 2014-2015, Folie Technique:

- reached close to 20,000 young people
- hired close to 40 university students in science and engineering
- welcomed 1,200 young people to its summer camp
- led 200 science workshops in primary schools, reaching 3,800 students
- held the Poly-Challenge Kit in over 185 classes in ten regions of Québec
- involved 50 classes in Professeur Polynume's Challenge
- conducted a major robotics project in six primary schools.

PROJET SEUR (awareness raising for education, university and research)

The SEUR is an institutional project created in 2000 by a professor from the Université de Montréal. The main objective is to make young people aware of the importance of knowledge and pursuing their education.

Target audiences are cycle 2 high school students (grades 9, 10 and 11) and CEGEP students, focusing on interactions with young people from disadvantaged or multiethnic backgrounds.

In 2014-2015, the SEUR project:

- held 144 conferences in 83 high schools and CEGEPS, reaching almost 8,100 students
- organized 37 meetings between a student and a researcher, professional or upper cycle student to discuss the field that interests them
- matched 24 demotivated students or at risk of dropping out of school with university students to support them and share their love of education
- organized the Sanofi Biogenius Canada challenge, which reached 14 budding scientists
- hosted 678 young people as part of summer immersion programs
- introduced two new components, "Access to medicine" and "Health sciences," which over 600 high school and college students participated in

FILM TRAINING FOR YOUNG MEMBERS OF FIRST NATIONS

Since 2010, UQAM has been working with Wapikoni mobile, an organization that fights isolation and suicide among young members of First Nations by making a travelling audiovisual creation studio available to them.

Under the supervision of the UQAM media school and with the cooperation of students in communications, every year the workshops offered at UQAM allow some 30 young members of First Nations to learn the basics of producing short films. Many films made during these sessions have been shown at international festivals and won awards. Not only does this training help showcase First Nations cultural heritage, it is also a way for participants to express their identity and to showcase their talent and to encourage them to pursue their education.

Sources: Folie Technique: drawn from the Folie Technique website (http://www.folietechnique.com); SEUR project: Université de Montréal; film training for young members of First Nations: UQAM.

3.3. CONTRIBUTION TO CULTURAL LIFE AND SPORTS

Universities enrich and enliven the cultural life of their communities. This contribution takes different forms, whether concerts, shows or other events presented in halls or auditoriums, exhibitions on the heritage of Montréal and Québec and entertaining activities that bring life to neighbourhood streets. For example, Box 3 describes two cultural initiatives, including a traveling exhibition on seniors and exclusion and an interdisciplinary research centre meant to increase knowledge about Montréal.

Through sports facilities for students and often the general public, universities also play a role in health promotion. Most universities run their own sports centre, which generally includes a fitness room, a pool, courts for racket sports and more.

BOX 3

Travelling exhibition "Avoir sa place. Les aînés prennent la parole"

In cooperation with the INRS VIES (Vieillissements, exclusions sociales et solidarités – Aging, social exclusion and solidarity) research team

Launched in November 2014, the travelling exhibition "Avoir sa place. Les aînés prennent la parole" (a place of one's own – seniors speak out) presents the results of research by the VIES team at the Institut national de la recherche scientifique (INRS).
Fifty-six people age 65 to 94 took part in group discussions about sites and situations of exclusion, and shared their individual and collective experiences. The exhibition gives visitors a chance to read the words of Montréal seniors and see photos on the same themes. It reveals different aspects of sites and situations of exclusion that seniors can experience daily. According to the presenters' estimates, it attracted close to 2,500 visitors (as of July 2015).

Centre for Interdisciplinary Research on Montreal (CIRM)

McGill University

The CIRM brings together 45 researchers from several Québec universities to contribute to a better understanding of the city. Knowledge transfer to society and its citizens is equally at the heart of CIRM's mandate. It seeks to ensure that Montréal takes full advantage of the expertise and innovation found in universities. The CIRM brings together researchers whose areas of interest and expertise are related to urban life or Montréal, in particular history, architecture, literature, communication and language sciences, political science, geography, urban planning, law, environmental studies and social work.

Sources: Regroupement des universités de la région de Montréal, KPMG analysis.

3.4. UNIVERSAL ACCESS TO KNOWLEDGE

Combined with the recent universal access to knowledge movement, the development of new technologies and their wide-scale deployment in every sphere of society helps disseminate knowledge. Quality training is available online to the general public, generally at no charge. This concept goes by the acronym MOOC, which stands for massive online open courses. In this area, three initiatives by Greater Montréal universities are particularly noteworthy.

- Launched in 2012 by HEC Montréal, and now offered jointly with the Université de Montréal and Polytechnique Montréal, the EDUlib online platform offers courses drawn from those available in the classroom, taught by the same professors. These free courses attract on average 2,500 to 10,000 participants, half of them from outside Québec.
- In fall 2014, the TÉLUQ began offering two free online courses. The courses Introduction à l'histoire politique du Québec (introduction to the political history of Québec) and Conciliation travail-famille: défis et solutions (work-family balance: challenges and solutions) address unique topics in the Francophonie. Offered over a number of weeks, these courses include a variety of activities supported by videos, readings, automated questionnaires and interactive debates.
- At McGill, management professor Henry Mintzberg has taken the concept even further by putting together the online course Social Learning for Social Impact, which promotes group learning (GROOC). As part of this course, Dr. Mintzberg, some 20 professors and facilitators lead interactive discussion groups online. Over 8,000 people from 165 countries are registered for them.

21 Traduction française de Massive Online Open Course, ou MOOC.

CONCLUSION

To prosper, major metropolitan areas such as Montréal need an educated population with a solid store of knowledge. In a dynamic economy based largely on promoting knowledge, growth depends on skilled, even highly skilled, jobs.

Universities are at the heart of knowledge transfer. Universities not only transfer knowledge, they also play a fundamental role in creating it, conducting close to 40% of research and development in Québec. Since R&D is essential to the performance of leading-edge sectors in Montréal, universities are a key factor in the city's innovation system.

The strength of universities also lies in the size of the student population and the diversity created by foreign students. The some 155,000 students who frequent Greater Montréal universities account for 5% of the population of the CMA of Montréal. All cycles combined, international students represent 15% of the student population, a proportion that increases significantly in master's and doctoral programs. Universities therefore lend Montréal the vitality it is known for, characterized by a constant turnover in its pool of students.

By contributing to the development of human capital through the knowledge transferred to their graduates and through the creation and dissemination of knowledge, universities increase the productivity of all of society. That is one of the most important and distinctive impacts of the role of universities. The contribution of university graduates to increasing the GDP of Greater Montréal was an estimated $22.7 billion for 2014-2015. This is in addition to economic spinoffs from university spending, which were $3.5 billion that same year, and those of foreign students, which were $367 million.

To support long-term economic growth, Québec must continue to promote universities. It is by investing in knowledge that Greater Montréal and the province will continue to prosper and make their mark internationally.

APPENDIX I À V

APPENDIX 1

CALCULATION OF THE INCREASE IN PRODUCTIVITY

Human capital

To estimate the contribution of Greater Montréal universities to the increase in productivity attributable to human capital, we used Fernand Martin's original methodology, as published in November 2008 in the study entitled *Future Prosperity Depends on Universities*.

In 2015, the population of Québec had 687,000 employed bachelor's degree holders and 312,100 employed graduate degree holders. These statistics take into account all graduates with a full-time job and assume that a graduate working part time is the equivalent of 0.5 of a graduate working full time.

To evaluate the contribution of these workers to improving human capital, we calculated the difference in gross income between holders of a college diploma and of a bachelor's degree in 2015. Then we multiplied this difference in salary by the number of employed graduates, and then by a factor of 65%, which corresponds to the share of university graduates from Greater Montréal in Québec in 2014-2015. We applied the same calculations for those with a graduate degree.

The contribution of graduates from Greater Montréal universities to the increase in productivity attributable to the improvement in human capital in Québec was estimated at over $16.4 billion for 2015, which represents 8.7% of the GDP of Greater Montréal. This estimate excludes the impact of holders of a university certificate lower than a bachelor's degree. It is therefore a conservative estimate.

TABLE 6
Contribution of universities in Greater Montréal to the increase in productivity attributable to human capital

IMPACT ON PRODUCTIVITY OF EDUCATION OF BACHELOR'S DEGREE HOLDERS	
Wage gap between a graduate with a bachelor's degree and a graduate with a college diploma	$19,835
Number of employed bachelor's degree holders in Québec	687,000
Percentage of graduates (bachelor's level) from Greater Montréal universities compared with all graduates in Québec	65%
Total difference for bachelor's graduates	$8.9 billion
IMPACT ON PRODUCTIVITY OF EDUCATION OF GRADUATE DEGREE HOLDERS	
Wage gap between a graduate with a graduate degree and a graduate with a college diploma	$35,158
Number of graduates with graduate degrees in Québec	312.100
Percentage of graduates (graduate level) from Greater Montréal universities compared with all graduates in Québec	68%
Difference for graduate degree holders	$7.5 billion
Total contribution of Greater Montréal universities to improving human capital	**$16.3 billion**

Sources: Dupuis, François. St. Maurice, Yves. Martin, Fernand. "La prospérité future passe inévitablement par les universités," Études économiquess, Desjardins, November 19, 2008; KPMG analysis.

Creation and dissemination of knowledge

To assess the economic impact of Greater Montréal universities on the creation and dissemination of knowledge, we again used the study by Fernand Martin, which has been used and adapted by many researchers.

This methodology quantifies the impact of universities on the increase in productivity attributable to factors of production other than capital and labour, what is called total multifactor productivity. This methodology isolates the impact on production of the creation and dissemination of knowledge, from which we subtract R&D imports.

Accordingly, the economic impact of universities in Greater Montréal resulting from the creation and dissemination of knowledge was an estimated $6.4 billion in 2014.

TABLE 7
Contribution of universities in Greater Montréal to the increase in productivity attributable to the creation and dissemination of knowledge

IMPACT ON PRODUCTIVITY OF EDUCATION OF BACHELOR'S DEGREE HOLDERS	
Growth in GDP from 1981 to 2014[1]	$171.2 billion
Contribution of total factor productivity to growth in GDP from 1981 to 2014: 20%[2]	$34.2 billion
R&D imports (31%)[3]	$10.6 billion
Subtotal	**$23.6 billion**
Share of Québec universities in Québec R&D (39%)[4]	$9.3 billion
Share of Greater Montréal universities in Québec R&D (69%)[5]	**$6.4 billion**

KPMG analysis, based on the following sources:

(1) Statistics Canada, CANSIM 384-0038.
(2) OECD, "Technology, Productivity and Job Creation," Analytical Report, vol. 2, 1996.
(3) Martin, Fernand, "The Economic Impact of Canadian University R&D," Research Policy, 27 (7), 1998.
(4) Institut de la statistique du Québec.
(5) CAUBO database.

APPENDIX II

DEGREES GRANTED BY UNIVERSITIES IN GREATER MONTRÉAL IN 2014-2015

TABLE 8
Degrees granted by Greater Montréal universities by type
2014-2015

CYCLE	TYPE	NUMBER OF DEGREES AWARDED
Cycle 1	Certificate	11,635
	Bachelor's*	23,901
	Other	4,185
Cycle 2	Master's	7,847
	Other	4,550
Cycle 3	Doctorate	1,410
	Other	5
TOTAL		**53,533**

** Includes bachelor degrees by accumulation of certificates.*

APPENDIX III

METHODOLOGY

This section describes the types of economic impacts that will be evaluated and explains the main assumptions. It distinguishes between economic benefits associated with university spending and spending by students from outside Québec.

The outline of economic impacts assessed

There are generally two different levels of economic impacts. The first measures the economic benefits resulting from a shock from new spending within a given territory. This level of impact is often called "static economic benefits." The second level is impacts on an economy that are deemed "structuring" or "dynamic." Other benefits are due to effects that help improve the overall economic performance of businesses in a region or an industry.

This report concentrates first on static economic impacts. These benefits correspond to the multiplying effect of expenditures by universities in Greater Montréal and spending by their students from outside Québec. These impacts essentially measure the cascade effect produced by the injection of money into a given territory. The more integrated an economy is, or the more the initial expenditure will involve local sectors, the greater the economic benefit. Benefits have been assessed for all of Québec.

"Static" economic benefits are divided into two broad groups, i.e. direct and indirect effects of spending.

- Direct effects are revenue effects directly attributable to spending. This is revenue generated with the organization's first agents. It takes the form of salaries paid to these first agents, that is, support employees and university professors, and also includes other revenue generated (e.g.: amortization).
- Indirect effects are revenue effects resulting from a demand for goods and services in other industrial sectors from the organization's activities. This is similar to impacts among suppliers. For example, these effects correspond to demand for intermediate goods from the organization's suppliers (e.g.: professional services, specialized technical services, IT equipment, supplies, energy, etc.). They also take the form of salaries paid to the employees of suppliers and other revenue for them (e.g.: profits, amortization, etc.).

Direct and indirect economic impacts have been calculated using the Institut de la statistique du Québec's (ISQ) intersectoral model, which is the benchmark tool. The measurements of economic benefits presented in the body of this report do not include knock-on effects (or the impact of salaries earned being spent).[22]

22 Knock-on effects are revenue effects resulting from spending in goods and services by workers who enjoy direct and indirect benefits. However, these benefits have been the subject of criticism because they assume that individuals who find a job as part of a project would not have alternate sources of income and therefore could not have engaged in this consumer spending. Not to mention that these effects presume that the sectors stimulated do not have available capacity. Furthermore, knock-on effects are much more relevant when only local or regional effects are considered, notably in areas where unemployment rates are relatively high and where employment revenue is more limited.

Assumptions for the evaluation

The evaluation of static economic benefits is based on a number of assumptions; here are the main ones.

- Details on spending by type of good and service for the year 2013-2014 were provided by Greater Montréal universities.
- The number of direct jobs was estimated using the average salary in Québec in 2014 by full-time equivalent (FTE) in the university sector, a statistic provided by the ISQ, and the total payroll paid by universities for 2013-2014.
- The calculation of economic benefits is based on the structure of average expenditures from the Institut de la statistique du Québec's intersectoral model. The 2014 version of the model was used. Benefits would vary if the average spending structure were to change.
- The benefits calculated with respect to government revenue are gross. No government support is requested. The net impact may differ depending on whether there is government financial support.
- The estimate of government revenue is based on the tax structure for 2014 and includes the following:
  - For Québec, tax benefits are calculated using the Institut de la statistique du Québec's intersectoral model. They include taxes on salaries and wages, sales and other specific taxes, as well as revenue from Québec's Health Services Fund.
  - Direct sales and specific taxes include an estimate of consumption taxes resulting from employee spending after savings. The calculation is based on the direct payroll paid, minus taxes on salaries and wages, employee contributions to parafiscal regimes, and a savings rate of 3% calculated on disposable income.
  - The estimated contribution to the Health Services Fund was obtained directly from the ISQ with respect to the direct effect. For the indirect effect, the minimum contribution rate applicable to companies (2.7%) was multiplied by the indirect payroll, while employee contributions were estimated based on the average salary of indirect employees and the applicable contribution level from Revenu Québec schedules.
  - Tax benefits could obviously differ if changes were made to the tax system and rates.

Furthermore, KPMG chose to be conservative when other assumptions had to be made. Therefore, the results of static economic benefits may be considered conservative in view of these assumptions.

Spending by students from outside Québec

Average expenditures by students come from HEC Montréal and Université de Montréal's model budgets for international students. Tuition fees are excluded to avoid double counting, because they have already been accounted for in university spending.

It was assumed that undergraduate students attended university and spent locally eight months of the year, and, for graduate students, twelve months a year. The duration of study does not have an impact on fixed costs such as medical insurance and clothing expenditures.

TABLE 9
Estimate of spending by students from outside Québec
2014-2015

SPENDING PER YEAR	PER UNDERGRADUATE STUDENT	PER GRADUATE STUDENT
Housing and other expenses	$4,093	$6,140
Food	$2,865	$4,298
Medical insurance	$651	$651
School supplies*	$256	$384
Local transportation	$409	$614
Telecommunications (phone and Internet)	$819	$1,228
Leisure and clothing	$2,047	$2,047
TOTAL	**$11,139**	**$15,362**

* Estimates reflect the fact that a portion of school supplies will be purchased in a university store.

Sources: Dépenses de subsistance des étudiants (HEC Montréal), Guide du candidat étranger (Université de Montréal), KPMG analysis.

Weighted according to the number of students at each level of study, average annual expenditures are in the order of $12,500 per student from outside Québec. These expenditures were then multiplied by the number of students from outside Québec at each level of study to obtain total expenditures, which were used to calculate benefits using an Institut de la statistique du Québec simulation tool for economic benefits.

APPENDIX IV

DETAILED TABLES OF ECONOMIC BENEFITS

Economic benefits generated by expenditures by students from outside Québec

TABLE 10
Economic impacts associated with spending by students from outside Québec – Impacts in terms of added value and jobs across Québec

2014-2015, in millions of dollars and in person-years

	QUÉBEC		
	DIRECT EFFECTS	INDIRECT EFFECTS	TOTAL EFFECTS
Added value (millions of dollars)	**212.7**	**154.8**	**367.4**
Pre-tax salaries and wages	50.2	75.2	125.3
Gross mixed income (1)	28.3	15.9	44.2
Other pre-tax gross income (2)	134.2	63.7	197.9
Jobs (person-years)	**1,211**	**2,198**	**3,408**

(1) Gross mixed income refers to the income of unincorporated businesses (sole proprietorships).
(2) Other pre-tax gross income refers to benefits, profits, amortization, etc.

Source: KPMG estimates from Institut de la statistique du Québec simulations.

TABLE 11
Economic impacts associated with expenditures by students from outside Québec – Impacts in terms of revenue for the Government of Québec

2014-2015, in millions of dollars

	GOVERNMENT OF QUÉBEC		
	DIRECT EFFECTS	INDIRECT EFFECTS	TOTAL EFFECTS
Tax on salaries and wages	4.4	5.8	10.2
Sales and specific taxes (1)	33.4	3.7	37.1
HSF (employees and employers) (2)	1.5	2.3	3.8
TOTAL	**39.3**	**11.8**	**51.1**

(1) Sales taxes (QST and GST) and other taxes (for example, the accommodation tax or the tobacco tax in Québec, or federal excise duties).
(2) The HSF was estimated by KPMG from the minimum contribution rate based on the average salary.

Source: KPMG estimates from Institut de la statistique du Québec simulations.

TABLE 12
Economic impacts associated with expenditures by universities in Greater Montréal – Impacts in terms of added value and jobs across Québec

2013-2014, in millions of dollars and person-years

	QUÉBEC		
	DIRECT EFFECTS	INDIRECT EFFECTS	TOTAL EFFECTS
Added value (millions of dollars)	**2,857.0**	**693.4**	**3,550.4**
Pre-tax salaries and wages	2,132.4	351.8	2,484.2
Gross mixed income [1]	0.0	54.4	54.4
Other pre-tax gross income [2]	724.6	287.2	1,011.8

1 Gross mixed income refers to the income of unincorporated businesses (sole proprietorships).
2 Other pre-tax gross income refers to benefits, profits, amortization, etc.

Source: KPMG estimates from Institut de la statistique du Québec simulations.

TABLE 13
Economic impacts associated with expenditures by universities in Greater Montréal – Impacts in terms of revenue for the Government of Québec

2013-2014, in millions of dollars

	GOVERNMENT OF QUÉBEC		
	DIRECT EFFECTS	INDIRECT EFFECTS	TOTAL EFFECTS
Taxes on salaries and wages	204.1	27.5	231.6
Sales and specific taxes [1]	120.9	38.4	159.3
HSF (employees and employers) [2]	6.9	1.3	8.2
TOTAL	**332,0**	**67,3**	**399,2**

(1) Consumption taxes (QST and GST) and other taxes (for example, the accommodation tax or the tobacco tax in Québec, or federal excise duties). Also includes an estimate of consumption taxes related to salaries earned.
(2) The HSF amount was provided by the ISQ; the indirect HSF was estimated by KPMG using the minimum contribution rate based on the average salary.

Source: KPMG estimates from Institut de la statistique du Québec simulations.

APPENDIX V

INTERNAL RATE OF RETURN – METHODOLOGY

N.B.: The calculation of the IRR is primarily based on the methodology established by the Ministère de l'Éducation, du Loisir et du Sport.[23] Unlike the econometric approach, this methodology does not control for self-selection bias, i.e. isolating the portion of the salary differential associated with characteristics specific to each person, and could therefore overestimate the return of a university education.

Private internal rate of return (IRR) associated with a bachelor's degree

The private IRR relates the net income differential between the holder of a bachelor's degree and the holder of a college degree (DEC) to the cost of obtaining the bachelor's degree for a student, according to the following formula:

$$Present\ value \quad = 0 = \sum_{i=1}^{n}\left[\frac{(NIB_i - NID_i) - X_i}{(1+r)^i}\right]$$

Where:

NIBi = net income of the holder of a bachelor's degree at period i

NIDi = net income of the holder of a DEC at period i

Xi= cost of university studies for the student

r = private internal rate of return

The term NIBi–NIDi therefore represents the salary differential after taxes between holders of a bachelor's degree and a DEC. It also takes into account the opportunity cost for students during their university education. The variable r represents the rate of return that solves the equation and the present value of which is equal to 0.

The gross income used here is from Statistics Canada's 2011 National Household Survey, capitalized according to the rate of growth in salaries in Québec from 2011 to 2013. For the purposes of calculating net revenue, estimated taxes include income tax, consumption tax and contributions to employment insurance (EI), to the Régime des rentes du Québec (RRQ) and to the Régime québécois d'assurance parentale (RQAP). It is also assumed that workers will contribute the maximum allowable to a registered retirement savings plan (RRSP). This assumption is used instead of tax deductions and exemptions that individuals may claim, and is based on the work of Ebrahimi and Vaillancourt.[24]

The costs taken into account for this study are tuition fees payable, school supplies and a computer. Housing and other living expenses are excluded from the analysis, since these costs occur regardless of the student's status.

The main assumptions for calculating rates of return are presented below.

23 See: Ministère de l'Éducation, du Loisir et du Sport du Québec, Taux de rendement du baccalauréat: pour les diplômés et pour l'État, December 2008.
24 See: Ebrahimi, P., & Vaillancourt, F., Le rendement privé et social de l'éducation universitaire au Québec: Estimations reposant sur le Recensement de 2006, Montréal, November 2010.

Main assumptions for calculating internal rates of return

VARIABLE	ASSUMPTION	SOURCE (IF RELEVANT)
PARAMETERS		
Duration of full-time studies	Average duration of a bachelor's program: 3.4 years Average duration of pre-university college education: 2.4 years Average duration of technical college education: 3.8 years Estimated weighted duration according to number of students: 3.1 years	Ministère de l'Éducation, du Loisir et du Sport, *Indicateurs de l'éducation*, 2013 edition.
Real growth in salaries	Annual real growth estimated at 1%, reflecting real growth in productivity of human capital.	See: Ministère de l'Éducation, du Loisir et du Sport, December 2008.
BENEFITS		
Gross average salaries	Data for the year 2010 comes from the 2011 National Household Survey. The growth in average salaries up to 2014 is estimated based on growth in weekly remuneration in Québec. For 2015, growth is estimated using the average from the previous five years.	KPMG assumption
Net average salaries	Contributions estimated according to the parameters for each of the programs: employment insurance, Québec Pension Plan, Québec Parental Insurance Plan.	
	RRSP contribution: maximum eligible contribution instead of tax deductions and exemptions individuals may claim.	See: Ebrahimi & Vaillancourt, November 2010.
	Consumption taxes (QST and GST): estimates based on the categorization of taxable household spending.	National Household Survey, Statistics Canada
COSTS		
Tuition	DEC: $294/year Bachelor's: $2,917/year	Fédération des cégeps UQAM
School supplies and equipment	DEC: $375/year Bachelor's: $796/year	Aide financière aux études
	One-time expense of $1,500 the first year for a computer	KPMG assumption
Opportunity cost	For each year of studies, opportunity cost is calculated based on a period of eight months, because it is assumed that students will work during the four months of summer.	KPMG assumption

OTHER

Government bursaries	Government bursaries per student are estimated by applying the average amount of bursaries per beneficiary to the percentage of students who receive bursaries.	Average amount of bursaries per beneficiary of loans and bursaries: estimates based on the 2013-2014 report of the Aide financière aux études. Number of students registered per program: Statistics Canada, Cansim 477-001 table (post-secondary students, according to study regime).

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