



> WHAT WE OFFER

Educated residents and funding for Research & Development (R&D) are essential for innovation. The Toronto Region has much to offer in these areas. The region has high and growing overall numbers of residents with post-secondary and post-graduate degrees. In addition, both government and private sector support for R&D in the region has increased, including collaborative R&D delivered by universities and colleges.

EDUCATION

HIGH AND GROWING LEVELS OF POST-SECONDARY EDUCATION

The Toronto Region is doing well with respect to overall level of education for the age range 25-34 years. These recent college and university graduates represent the “new” workforce.

As Fig. 13 illustrates, the Toronto Region comes first in college or university education in this age range and within the comparator selection. A larger percentage of the Toronto Region’s population has a college or university education than any of the comparator regions in this age range, with more than 65% of the population in 2006 holding at least a college diploma or associate’s degree. This represents an increase from 56% in 2001.

While the region does not perform well in terms of overall numbers of citizens with post-graduate and professional degrees in the total workforce compared to the selected comparators in the U.S., there has been a 2% overall increase in this measure (an increase of more than 17,000 people) since 2001 (Fig. 14). Only Montreal has enjoyed comparable growth. Indeed, the dramatic increase in post-graduate and professional degrees between 2001 and 2006 shows a healthy positive trend that many of the comparators have failed to replicate. Some of the U.S. comparators experienced a decline in this category, and many showed very small growth.

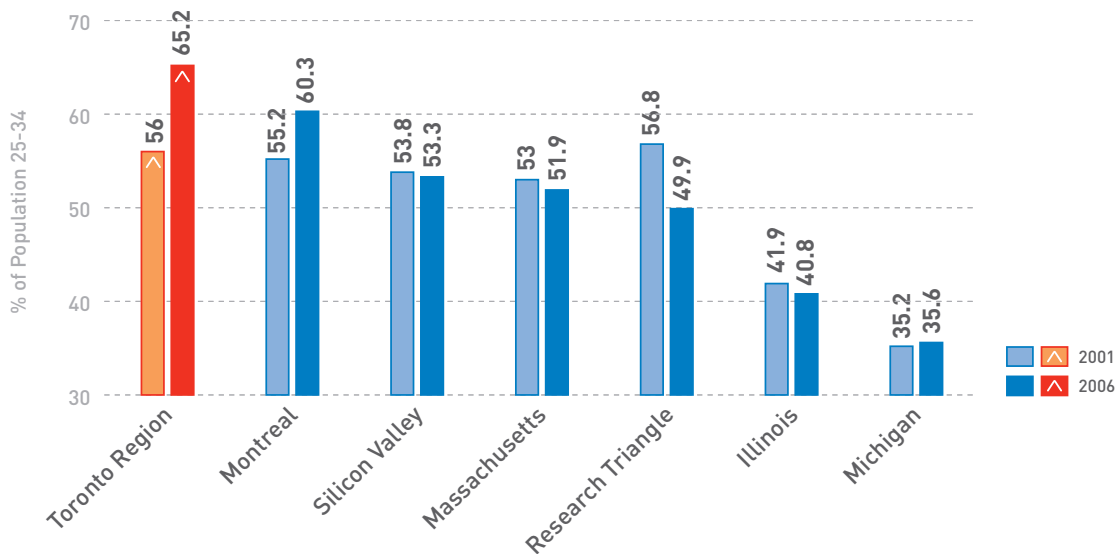
More Business, Science and Technology master’s and doctorate graduates are ready to become the next generation of managers and professionals.

GOVERNMENT SUPPORT FOR POST-GRADUATE EDUCATION

The Reaching Higher plan, unveiled in the 2005 Ontario Budget, targeted 14,000 new post-graduate spaces school by 2009/10. It also identified an additional 104 first-year undergraduate medical spaces by 2008/09. This program was part of the Ontario government’s \$6.2 billion investment in post-secondary education. (www.edu.gov.on.ca/eng/tcu/about/annualreport)

Fig. 13

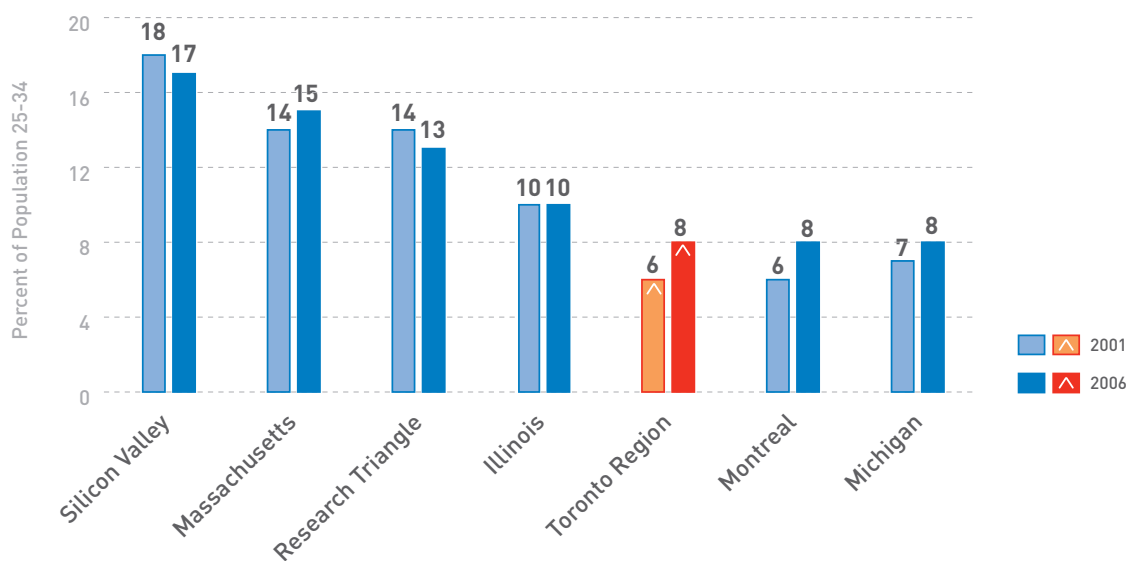
Percent of Population 25-34 years with a Post-Secondary Degree or Diploma, 2001 and 2006



Sources: Statistics Canada, U.S. Census Bureau

Fig. 14

Percent of Population Aged 25-34 years with a Post-Graduate and Professional Degree, 2001 and 2006



Sources: Conference Board of Canada, U.S. Census Bureau, California Department of Finance, MA Index

As Fig. 15 shows, in the period 2006-2007, the Toronto Region graduated more students in the category “all other university fields” than in business, science and technology. A closer look at the graduations in that period, however, shows that a greater number of post-graduate degrees were awarded in business science and technology as well as in professional degrees in medical-related fields and law (Fig. 16). This indicates that the overall education of the population is good at the undergraduate level and that more students are selecting professional post-graduate studies which adds to the talent pool of highly qualified individuals. This is likely to persist, with higher enrolment levels in post-graduate programs in Toronto Region universities.

These individuals are particularly important in light of another important study, which found that in 2001, Ontario managers still had a way to go to catch up with U.S. managers’ education levels. In 1996, 46% of U.S. managers had a university degree, compared to considerably fewer (31%) of Ontario managers. Ontario results for 2001 indicated that although the educational attainment of Ontario managers has increased, the province’s results in 2001 still did not match U.S. results for 1996. A higher percentage of Ontario managers had less than a high school diploma, and fewer Ontario managers had a high school diploma, a bachelor’s degree, or a graduate degree.¹²

“Cities with larger concentrations of degree holders – measured as a percentage of the local employment base – have, on balance, experienced faster employment growth – 2.0% per annum – than cities with smaller relative concentrations of degree holders – 1.6%. These differences may appear to be small but, due to compound growth, over the 20-year study period a city that grew at 2% would grow by 49%, while a city with a growth rate of 1.6% would grow by a more modest 37%.”

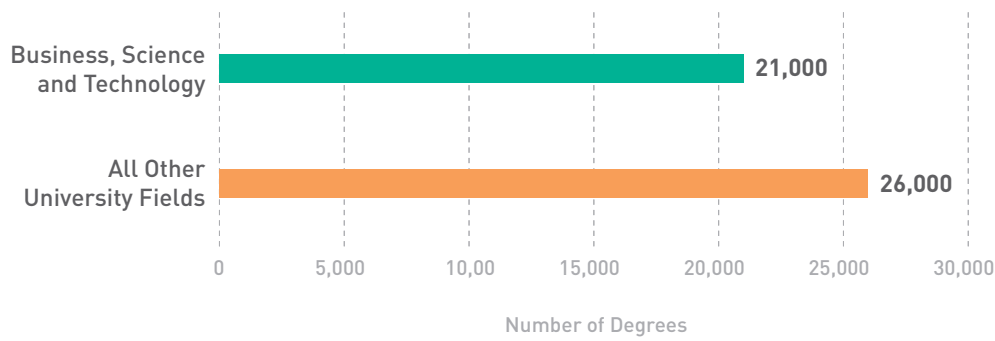
– Desmond Beckstead, W. Mark Brown and Guy Gellatly, *Cities and Growth: The Left Brain*. Stats Canada, 2008, p. 17.

Fig. 17 shows that the Toronto Region is graduating fewer engineers per 100,000 than comparator regions. There has, however, been a positive upturn in the graduation rate since 2001, with marked increases in undergraduate, master’s and doctorate degrees in engineering.

This rate of increase needs to be sustained and improved in all professional, scientific and technical disciplines to grow the workforce of the future. Even though the Toronto Region graduates fewer engineers, in absolute numbers, than the comparator regions, the number of engineers graduating has been steadily increasing, with 30% more bachelor’s between 2002 and 2007, for instance.

Fig. 15

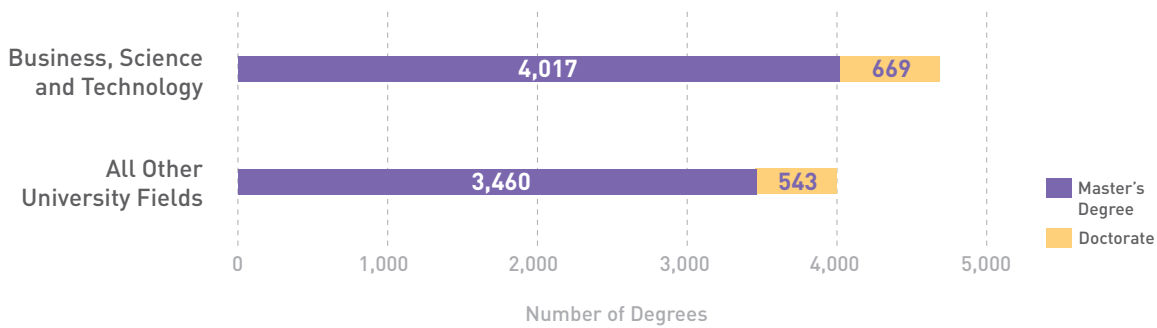
Percent of Population 25-34 years with a Post-Secondary Degree or Diploma, 2001 and 2006



Source: CUDO

Fig. 16

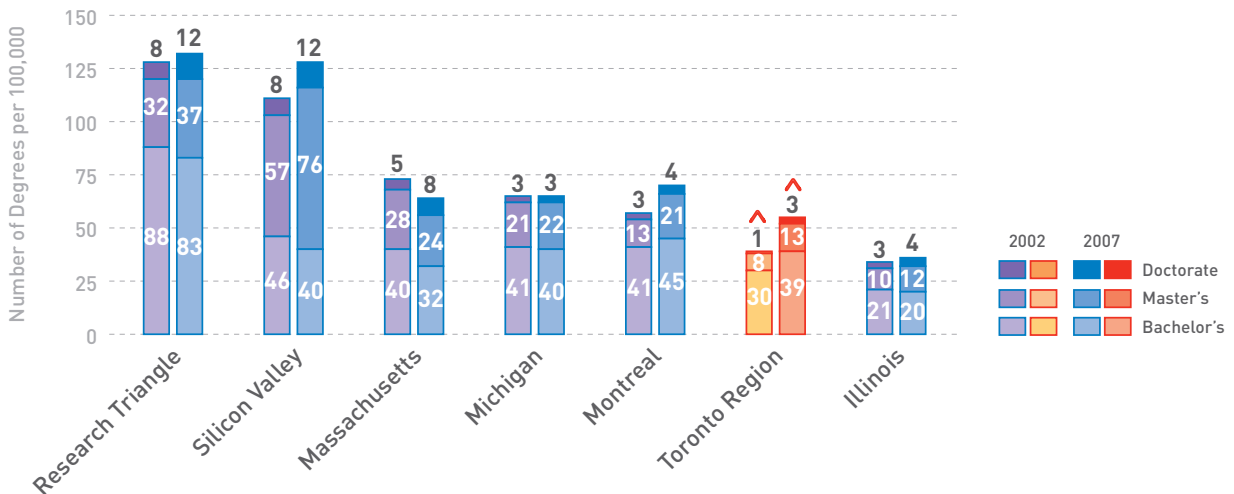
Post-graduate Business, Science and Technology, and Other Educational Degrees Awarded in the Toronto Region 2006-2007 Academic Year



Source: CUDO

Fig. 17

Engineering Degrees Awarded, per 100,000 Population, 2002 and 2007



Sources: CUDO, American Association of Engineering Societies Inc., Montreal Universities

THE TORONTO REGION NEEDS MORE RESIDENTS WITH UNIVERSITY DEGREES, PARTICULARLY POST-GRADUATE DEGREES

The high level of residents in the age range 25-34 who have first degrees and diplomas shows that the value of education is recognized in the Toronto Region.

Overall, the Toronto Region has fewer citizens with university degrees than select U.S. comparators. The U.S. has, however, far more post-secondary institutions – 4,000 colleges and universities¹³ – than Canada, including many private universities giving citizens greater access to higher education. Canadian and US qualifications are not, however, directly comparable as accreditation of institutions is voluntary in the U.S., not regulated by government as it is in Canada. Independent accrediting organizations are approved by the government and define minimum standards of education in the U.S. These organizations then certify whether schools, post-secondary institutions and other education providers' academic program meet and maintain that standard.¹⁴ The entities which conduct accreditation are associations comprised of institutions and academic specialists in specific subjects.¹⁵

Furthermore, the region has relatively fewer residents with post-graduate education; i.e., individuals who hold master's, professional degrees (such as M.B.A. or M.D.) or doctorates. As Michael McKenzie points out in a 2007 StatsCan report, "people who hold doctorates are an important piston in Canada's labour force engine. They not only represent the highest educational attainment level in a knowledge-based economy, they are also highly skilled industrial researchers and innovators, teachers and professors and scientists who take care of our health as well."¹⁶

More people with higher-level degrees would contribute dollars as well as expertise to the Toronto Region economy. The earning power of post-secondary graduates is considerably higher than for those who do not complete university or college. According to StatsCan figures for 2000, the average salary of a Canadian resident was \$32,000. For an Ontario resident, it was \$36,000. For a Toronto Region resident, it was \$42,000. Science and engineering doctorates in Toronto earned about double: \$81,450 for doctorates working in the private sector and \$83,321 for doctorates working in the public sector, for an average annual income of \$82,115 for both sectors.¹⁷

Canada's Institute for Competitiveness & Prosperity corroborates these findings, pointing out that "In both the stock and flow of science and engineering graduates, we trail the U.S. in graduate degrees."¹⁸

"...an emerging consensus is that as the world's economies become even more sophisticated, highly skilled workers are simply more valuable and earn higher incomes. And the difference in economic rewards received by them and less skilled workers widens. As

emerging economies, like China and India, advance, we can expect that less-skilled workers in the developed economies will fall further behind. There will also be greater competitive pressure on higher skilled workers, as China and India move up the value chain and compete on more sophisticated bases."

– Institute for Competitiveness and Prosperity, *Prosperity, Inequality and Poverty*, Sept. 2007, p. 8.

"We find significant interactions between scientists and engineers and the broader cross-section of degree holders located in cities: the latter may be the primary mechanism through which scientists and engineers contribute to the growth process. In short, scientists and engineers – the left brain of cities – matter most for growth when combined with a large and diverse pool of human capital."

– Desmond Beckstead, W. Mark Brown and Guy Gellatly, *Cities and Growth: The Left Brain*. Stats Canada, 2008, p. 32.

TORONTO REGION'S FLEXIBLE PART-TIME MASTER'S PROGRAM IN ENGINEERING

Toronto's Advanced Design and Manufacturing Institute (ADMI) is a unique commitment to achieve excellence in graduate engineering education. The Faculties of Engineering and/or Applied Science and the Business Schools of the partnering universities collaborate to deliver a quality master's degree program in Design and Manufacturing. The program builds on the expertise in manufacturing and design of four of the strongest academic programs available in the province of Ontario, and integrates the elements of business practices and management skills so essential in the competitive engineering marketplace. (www.admicanada.com)

WHY EDUCATION RESOURCES ARE IMPORTANT

In the past, the traditional Ontario manufacturing base provided high-paying jobs which typically did not require post-secondary education. Today, blue collar jobs that provide a middle class lifestyle are much less frequently available to the new entrant to the workforce and are on the decline within the working population.

As a recent StatsCan study pointed out, "there has been a transformation of the work force toward workers with higher skill levels, and those cities that are better able to attract these kinds of workers may end up the winners in this new age."¹⁹

There has been a transition from “doing” to “thinking” jobs, and studies confirm that a highly-educated workforce is essential for innovation. As one report completed for the government of Ontario says, “new graduates, who have had the opportunity to participate in the conduct of basic research, enter industry equipped with training, knowledge, networks and expertise. They bring to the firm knowledge of recent scientific research, as well as an ability to solve complex problems, perform research, and develop ideas. The skills developed through their educational experience with advanced instrumentation, techniques and scientific methods are extremely valuable. Students also bring with them a set of qualifications, helping set standards for knowledge in an industry.”²⁰

A large number of scientists and engineers in a city can make tremendous contributions to its research, economic growth and technological innovation. They can also forge important synergies with other degree-holders, and drive innovation much more forcefully than the other degree-holders could on their own. As the StatsCan paper *Cities and Growth: The Left Brain* puts it, “scientists and engineers – the left brain of cities – matter most for growth when combined with a large and diverse pool of human capital.”²¹

THE BOTTOM LINE

- The Toronto Region needs to sustain and grow its numbers of post-secondary graduates at the first degree or diploma level (bachelor’s degrees and college diplomas or certificates)
- The Toronto Region needs to be able to translate its current competitive advantage into more master’s and doctorate degrees
- Toronto Region needs to assess barriers to entry for students with respect to graduate degrees. We need to look at whether there are enough graduate positions, whether the system needs to be more flexible and accessible, and whether there should be more interaction with industry

RESEARCH & DEVELOPMENT FUNDING

Research & Development (R&D) funding includes support from the private sector, support from the public sector as well as joint support from both, in collaboration with one another. Research and development provides knowledge and technologies for transfer to the market and funding here is important to ensure sufficient supply of these.

Private sector support for R&D in the Toronto Region is increasing. In fact, by international G8 standards, Canada as a whole does well: the private sector funds more than 10% of university research.²²

Research conducted at universities, whether at a basic level or in partnership with industry is fundamental to the development of a competitive R&D infrastructure and, hence, innovation within Canada.²³

As Fig. 18 shows, the Toronto Region is conducting increasing amounts of R&D which involves collaboration between industry and universities. One important measure of this is the growing contribution that the National Sciences and Engineering Research Council (NSERC) Collaborative Research and Development (CRD) Grants program has been making to the Toronto Region. NSERC is a federal agency that invests in university research and training in the natural sciences and engineering by encouraging Canadian companies to invest in university R&D.²⁴ Its CRD grants program is intended to give companies that operate from a Canadian base access to the unique knowledge, expertise, and

educational resources available at Canadian post-secondary institutions and to train students in essential technical skills required by industry.²⁵

The scale of available government assistance and funding for R&D in the U.S. is much higher than in Canada (Fig. 19). Within Canada, Greater Montreal receives more R&D funding per capita than the Toronto Region.

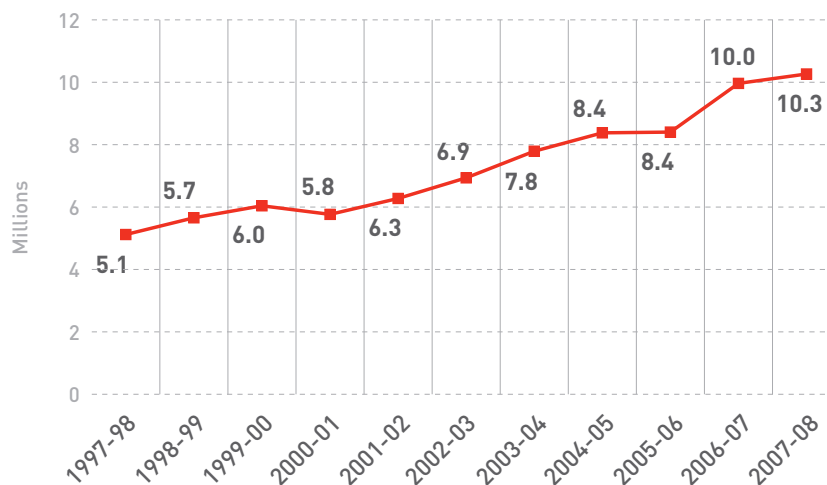
THE DIFFERENCE BETWEEN CANADIAN AND U.S. GOVERNMENT SUPPORT OF PRIVATE SECTOR R&D

The Canadian and U.S. governments take a significantly different approach to supporting private sector R&D. According to 2004 data, in Canada, government spends about 0.18% of GDP whereas governments in the U.S. spend about 0.26% of GDP on such support. The countries differ in level of support provided relative to the sizes of economies, with the US almost 45% higher, and in the mix of direct versus indirect funding. In Canada, about 84% of the support is in the form of tax credits (indirect), most notably the Scientific Research & Experimental Development (SR&ED) program and the balance (16%) is direct (grants, loans, etc). In the U.S., most support (76%) is in the form of direct grants and similar payments, with the balance (24%) in the form of tax incentives.

OECD, OECD Science, Technology and Industry Outlook, 2006

Fig. 18

NSERC Collaborative Research and Development Project Expenditures in Toronto Region, 1997-2008 (Constant 2006 CAD)



Source: NSERC

There is no single strategy that will improve this situation in the Toronto Region. The current range of strategies, including some new initiatives, have the potential to make an impact on and further strengthen the region's growing ability to attract more research funds to the region's institutions as well as more research-intensive firms. These include an increasing number of government initiatives aimed at educational institutes and research-intensive firms, as well as mechanisms to indirectly assist in funding private sector research such as federal R&D tax credits.

Spending on R&D in both the private and public sectors is low

As Fig.19 shows, the Toronto Region ranks poorly and is fifth out of seven in the natural sciences and infrastructure, faring better in social science, and last in health. In addition, in terms of private sector R&D, despite the increasing the amount of collaborative R&D it funds, the fact is clear that the Toronto Region is considerably lower in reported per capita expenditures on R&D than all of the other comparator regions, except Montreal (Fig. 20).

PROVINCIAL GOVERNMENT SUPPORT FOR R&D AND ADVANCED MANUFACTURING JOBS

Ontario will make \$150 million available over the next five years to attract new or enhanced biopharmaceutical investments to the province, through its Biopharmaceutical Investment Program (BIP). The provincial government will use these funds to support up to 20% of total eligible project costs. This public sector investment will increase the province's level of new biopharmaceutical R&D and advanced manufacturing, expand the footprint of local businesses, create new high value jobs for Ontarians, increase "deal flow" within Ontario's growing biotech cluster, and build capacity through collaborations with public research institutions.

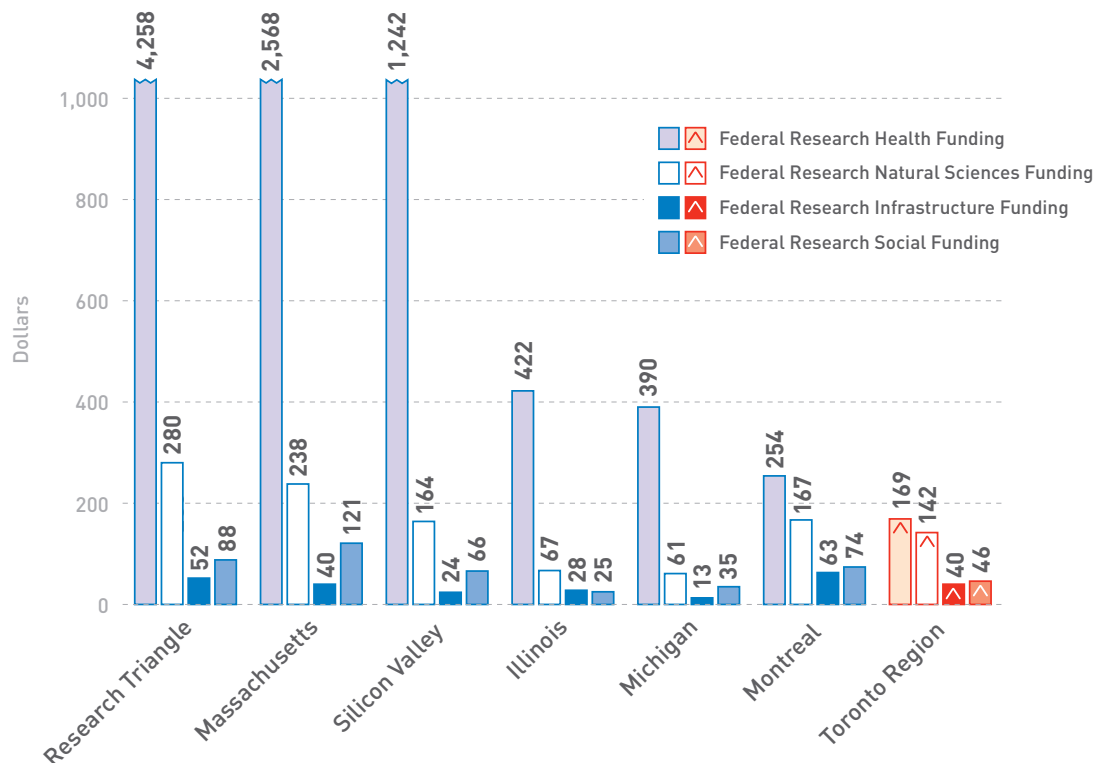
The government is also funding the Strategic Opportunities Program (SOP), a five-year discretionary, non-entitlement grant program that supports strategic, industry-led programs and projects in targeted areas of strength for Ontario including:

- Bio-economy and clean technologies
- Advanced health technologies, and
- Digital media and Information and Communications technologies (ICT).

(www.mri.gov.on.ca/english/programs/bip/program.asp, www.mri.gov.on.ca/english/programs/sop/program.asp)

Fig. 19

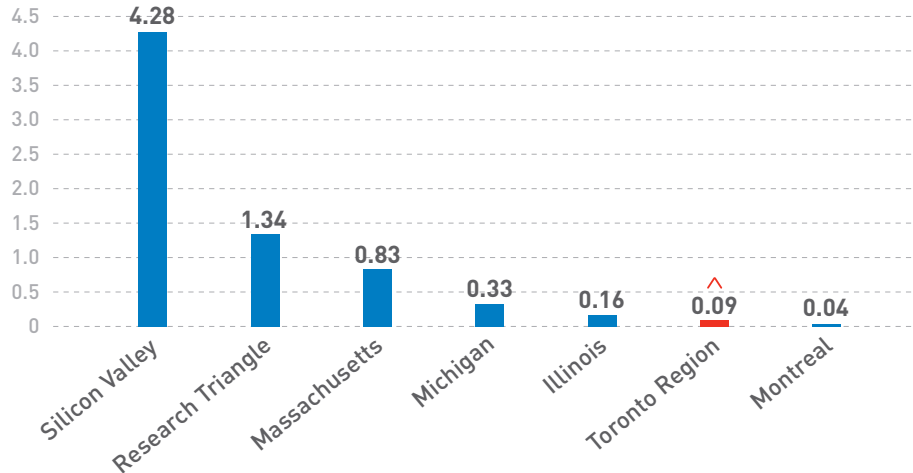
Federal Government R&D Funding to Research Institutions, Per Capita, 2000-2007, Constant 2006 USD



Sources: NSERC, CFI, CIHR, SSHRC, NIH, NSF

Fig. 20

R&D expenditure per \$1000 USD sales per 100,000 people, 2007



Source: Standard and Poor's COMPUSTAT

WHY R&D FUNDING IS IMPORTANT

The presence of R&D facilities moves industry “up the food chain,” from branch plants that manufacture goods into central facilities that create goods and wealth.

R&D staff in industry seek and maintain good relationships with universities. This is encouraged by employers and strengthens the link between both groups. Industries’ R&D departments add applicability to university training and add academic intelligence to industry, substantially benefitting both parties.^{26, 27}

R&D facilities in the private sector create opportunities for highly-trained post-secondary graduates. They create high value-add employment for post-secondary graduates trained in the Toronto Region, thereby encouraging them to stay in the region. They also ensure that the Toronto Region can attract highly-educated immigrants and employ them at an appropriate level. In addition, they strengthen innovation within the region by stimulating networks and interactions between and among the academic community and its counterpart in industry.

As Mike Lazaridis, founder, President and co-CEO of Waterloo-based Research in Motion said in his 2004 presentation to the fourth annual Re\$earch Money Conference in Ottawa, “if you really want to understand commercialization, all you have to do is attend convocation at your local university ... Armed with cutting edge

technology from around the world, the latest tools, the latest techniques and processes learned from their work under the very best researchers, they graduate with much fanfare and go on to build the industry, institutions and society of our country.”²⁸

R&D jobs tend to be highly paid, and are taken by professionals, raising the overall economic base and socioeconomic level of a region.

Post-secondary graduates tend to be comfortable around innovation and the adoption of new ideas and technologies, increasing the overall “innovativeness” of the area.

Government funding for R&D in universities upgrades the supply of innovation by encouraging competition for peer-reviewed R&D funding and interest from venture capitalists.²⁹

Support of R&D within the private sector supports the management talent necessary to commercialize R&D ideas. As highlighted by Roger L. Martin, “technical strengths in science and technology are probably the most important contributors to the quantity and quality of the supply of innovation. Management skills are critical to organizing R&D efforts, for setting priorities, developing strategies, and acquiring resources. Good management skills also provide the pressure to ensure high quality resource allocation decisions among competing priorities for research funding.”³⁰

THE BOTTOM LINE

- The Toronto Region needs R&D investment from the federal and provincial governments to strengthen the R&D infrastructure and build a base upon which to train graduate students and attract R&D-intensive industries as partners
- The Toronto Region needs to attract more R&D-intensive companies
- The Toronto Region needs to look at barriers to R&D in the region and in general