





List of Recommendations

1. Begin a systematic effort to eliminate Canada's HQP deficit by investing \$140M annually by 2022-23 to increase the number of master's and PhD graduates as recommended in the FSR.
2. Enrich the next generation of HQP's learning and research experience by providing graduate students with the opportunity and financial resources necessary to participate in global research networks. This will require broadening existing programs and eliminating current barriers.
3. Increase graduate students' and researchers' entrepreneurial know-how and awareness of industry needs by launching an entrepreneurship training program modeled on the US National Science Foundation's Innovation-Corps (I-Corps™) program.
4. Ensure that our leading research-intensive universities can build and sustain world-class research and training environments by addressing the **full costs of research** and closing the Research Support Fund funding gap.
5. Increase the number of students pursuing graduate studies, by expanding the Undergraduate Student Research Awards to other councils.

Introduction

In Budget 2018, the Canadian government responded to the Fundamental Science Review (FSR) – the first review of its kind in more than 40 years – by making historic investments in basic, investigator-initiated research, and research infrastructure. These investments will fuel the research enterprise, help us attract and retain top research talent from across Canada and around the world, and improve Canada's economic prosperity.

Canada's economic prosperity also requires a diverse and inclusive research enterprise. The U15 supports the government's commitment to increasing the diversity of Canada's researchers, a goal consistent with our institutions' long-standing commitment to equity, diversity and inclusion.

The recommendations contained in this document are well aligned with the Canadian government's vision. They also address some of the remaining elements of the FSR.

The Talent Imperative

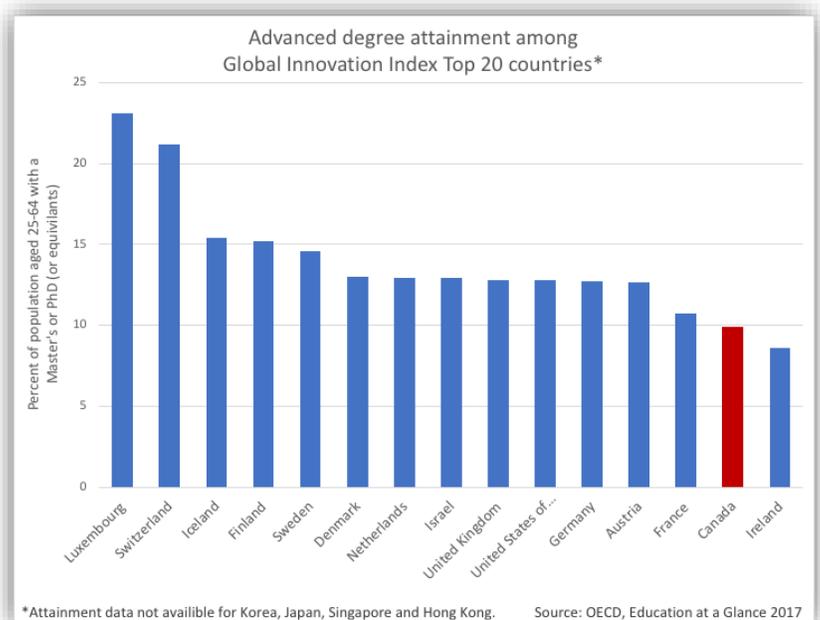
We live in an era of robust international competition. Canada's ability to prosper in this competitive environment depends upon our ability to navigate the challenges and opportunities associated with being a trading nation in a world characterized by growing protectionism. A key element in our economic strategy must be to develop a workforce that is effective, creative, adaptable, and innovative.

A recent OECD working paper found that the availability of highly qualified personnel (HQP) with advanced degrees (i.e., PhDs) is a key criterion leading businesses use when deciding where to locate new R&D facilitiesⁱ. Google, Facebook, Tesla, Amazon, and other leading companies' recent investments in Canada support this observation. To continue attracting similar high-quality, job-creating investments, we need unique, world-leading research capabilities backed by a deep pool of world-class talent. These are also the same inputs that fuel home-grown entrepreneurship and innovation.

As we work to expand our economy, we must also grapple with the challenges and opportunities associated with automation. The McKinsey Global Institute (MGI) estimates that about 50 percent of people's paid activities could be automated. Activities such as processing or collecting data, or performing physical activities (including operating machinery) in a predictable environment are particularly susceptible to automation. Activities such as interfacing with stakeholders, applying expertise to decision-making, planning and creative tasks, or managing and developing people are less vulnerable to automation.ⁱⁱ Similarly, a recent Innovation Technology and Innovation Foundation (ITIF) report found that automation is likely to result in "relatively fewer lower-paying jobs and more better-wage jobs."ⁱⁱⁱ

Given these realities, our country's long-term prosperity depends on a comprehensive approach to developing a highly talented, creative workforce, including adequate numbers of HQP.

Unfortunately, Canada has some critical gaps in this area. The current proportion of Canadians with a graduate degree is only 10 percent, compared to the OECD



average of 13 percent^{iv}. This places us 25th among OECD countries – well behind innovation leaders such as the US, UK, Sweden and Germany^v. This is what we call “Canada’s HQP deficit.”

The federal Advisory Council on Economic Growth reinforced the need to address “Canada’s HQP deficit” in its report, *Learning Nation*. The Council called for Canada to “set higher targets for the number of master’s and doctoral graduates while strengthening incentives for businesses to hire this specialized talent.”^{vi} Accordingly, The U15 recommends Budget 2019 begin responding to the Advisory Council’s call to action by increasing the number of, and support for, master’s and PhD candidates. These graduates bring their high-level research and analytical skills, as well as their expertise, to the private sector, not-for-profits, and government.^{vii}

Effectively increasing our HQP quotient requires us to keep equity, diversity and inclusion (EDI) as core principles. This is not just the right thing to do; it is necessary. We can only have a world-leading HQP talent pool if we eliminate barriers to women, Indigenous people, minorities, and persons with disabilities. We should apply this lens to all initiatives in this document.

Eliminating Canada's HQP Deficit

A comprehensive approach to addressing Canada's HQP deficit will require government to a) enhance its support for graduate students, b) invest in the learning and training environment, and c) encourage more undergraduates to pursue an advanced degree.

Scholarships and Fellowships

If Canada is to eliminate its HQP deficit, addressing current shortcomings in how we support our graduate students must be a priority. The 2017 Fundamental Science Review (FSR) noted that Canada's core scholarship programs have stagnated in numbers and value for many years. The FSR also found that the current suite of awards was unnecessarily complex, too few in number and, generally, too low in value. The FSR recommended that the scholarship and fellowship programs be harmonized across granting councils and provided with significant additional investments. As we work to eliminate Canada's HQP deficit, addressing these challenges is critical. Budget 2018's commitment to review scholarships and fellowships is thus most welcome.

Recommendation: Begin a systematic effort to eliminate Canada's HQP deficit by investing \$140M annually by 2022-2023 to increase the number of master's and PhD graduates as recommended in the FSR.

A World-Class Learning and Research Environment

For Canada to be a globally competitive knowledge economy, we must train our students in world-class research and learning environments. The recently announced Future Skills Centre (FSC) represents an exciting opportunity for Canada to develop innovative ways to more effectively skill, upskill and reskill our workforce. Equally important is the need to implement and scale proven high-impact educational practices for graduate students: international student mobility, experiential learning and world-class research and learning environments.

International mobility

Research and commerce are global. It is worth noting that a recent study showed that 32 percent of Forbes Global 2000 company CEOs studied abroad for at least one semester.^{viii} To educate the next generation of HQP successfully, we must

give our students the opportunity to augment their research experience by working and collaborating with their peers wherever they may be in the world. Expanding international research opportunities for graduate students through a global education strategy is an exciting prospect that will pay dividends for years to come. Simultaneously, it is important to address the barriers to international mobility in some of our existing programs, as noted by the FSR panel.

Recommendation: Enrich the next generation of HQP's learning and research experience by providing graduate students with the opportunity and financial resources necessary to participate in global research networks. This will require broadening existing programs and eliminating current barriers.

Experiential learning – an entrepreneurial perspective

Expanding experiential learning has become a priority for businesses, universities and governments across the country. The U15 supports the Business/Higher Education Roundtable's goal of ensuring that 100 percent of post-secondary students have access to a work-integrated learning opportunity. With regards to graduate students, a number of important experiential learning opportunities already exist (e.g. NSERC-CREATE, research assistantships and MITACS internships). In addition to these opportunities, graduate students would benefit from a program that helps them become successful entrepreneurs.

One such proven program is the US National Science Foundation (NSF) Innovation Corps (I-Corps™). Within the I-Corps™ program, teams (typically made up of a senior researcher or post-doc, a graduate student and an experienced entrepreneur), work together to commercialize a discovery they have made. The program provides the team with structured training that involves extensive industry engagement, to help team members better understand their discovery's commercial potential.

Recommendation: Increase graduate students' and researchers' entrepreneurial know-how and awareness of industry needs by launching an entrepreneurship training program modeled on the US National Science Foundation's Innovation-Corps (I-Corps™) program.

World-class research and training environments – full costs of research

As noted previously, Budget 2018 made historic investments in Tri-Council research funding. However, in addition to direct research investments (research grants), a world-class research environment requires support for the institutional costs of research, such as facility costs and commercialization supports. Budget 2018 did not move the needle in addressing the full costs of research through the Research Support Fund (RSF). Because of the nature of the RSF funding formula, research-intensive universities are particularly affected by the persistent RSF funding gap. For example, the average RSF funding rate for all U15 institutions is 20.5 percent, with a low of 19.2 percent. In comparison, the average indirect cost rate for the public universities that are members of the Association of American Universities (AAU) is 52.8 percent^{ix}. The RSF funding gap seriously compromises the quality of the research and learning environment and hinders the ability of our research-intensive universities to: a) attract world-class professors and students; b) retain our own future leaders; c) invest in activities that support our ability to commercialize research and partner with industry. Our ability to attract top professors and international students is particularly important. Almost half of international graduate students become permanent residents within 10 years of their first arrival – a real brain gain for our country^{vii, x}.

Recommendation: Ensure that our leading research-intensive universities can build and sustain world-class research and training environments by addressing the **full costs of research** and closing the Research Support Fund funding gap.

Undergraduate Research Opportunities

To expand Canada's proportion of highly qualified personnel, we must encourage more undergraduate students to pursue graduate studies. Studies have shown that students who participate in research projects during their undergraduate studies are more likely to pursue graduate studies than students who did not have that opportunity^{xi}.

Undergraduate research opportunities help students learn to tackle big questions with no clear answers. The ability to turn questions with no clear answers into opportunities is critical in an era where change and uncertainty are ubiquitous. That skillset is even more important since businesses are increasingly focused on testing ideas, tracking results and iterating – a process that closely resembles the scientific method.

Each year, NSERC supports about 3000 undergraduates in research activities through their Undergraduate Student Research Awards program. The other councils do not have similar programs.

Recommendation: Increase the number of students pursuing graduate studies, by expanding the Undergraduate Student Research Awards to other councils. This would require an investment of \$22M/year.

Conclusion

The U15 believes that the recommendations contained in this document are well aligned with the vision of the government of Canada and that of Innovation, Science and Economic Development (ISED).

We thank the Committee for this opportunity and look forward to working together as we strive to enhance Canada's economic prosperity and competitiveness through research and innovation.

ⁱ Belderbos, R. *et al.* "Where to Locate Innovative Activities in Global Value Chains". OECD, 2016.

ⁱⁱ "A Future That Works: Automation, Employment and Productivity". McKinsey Global Institute, 2017.

ⁱⁱⁱ Atkinson, Robert D. "Emerging Technologies and Preparing for the Future Labor Market". ITIF, 2018.

^{iv} "Education at a Glance 2017". OECD, 2017.

^v Dutta, S. *et al.* (editors). "Global Innovation Index 2017". Cornell, INSEAD, WIPO, 2018.

^{vi} "Learning Nation". Advisory Council on Economic Growth, 2017.

^{vii} "Employed and Engaged – An Overview of the 10,000 PhDs Project". University of Toronto, 2018.

^{viii} Study.eu, "The academic backgrounds of the world's most powerful CEOs". 2017.

^{ix} Ledford, H. "Keeping the Lights On", *Nature*, Volume 515, 2014.

^x Lu, Yuqian and Hou, Feng. "International Students who Become Permanent Residents in Canada". Statistics Canada, 2015.

^{xi} Wilson, Allan E. *et al.*, "Assessing Science Training Programs: Structured Undergraduate Research Programs Make a Difference" *BioScience*, July 2018.