

The House of Commons Standing Committee on Finance 2018 Pre-Budget Consultation

Submission by :

Science & Policy Exchange / Dialogue Sciences et Politiques

Science & Policy Exchange is a non-profit advocacy group run by graduate students and post-doctoral fellows in Montreal, whose mission is to foster the student voice in evidence-based decision making and to bring together leading experts from academia, industry, and government to engage and inform students and the public on issues at the interface of science and policy.



SCIENCE & POLICY EXCHANGE
DIALOGUE SCIENCES & POLITIQUES

Charity Number: 81105 8643 RR0001

contact@sp-exchange.ca

www.sp-exchange.ca

Executive Summary

This brief outlines the critical impact of fundamental research funding on the training and careers of the next generation of scientists, as well as the importance of skills development initiatives for students. Fluctuations and uncertainty in funding hit students and postdoctoral fellows the hardest as it impairs their career development in its most critical point. Given that a large portion of research funding is dedicated to jobs and training, accrued investments will both support the development of a skilled, productive, and diverse workforce and create jobs, thereby helping to growing the Canadian economy and middle class. We therefore broadly support the recommendations of the Fundamental Science Review. We furthermore applaud the previous budget's support of co-op and skill-centered initiatives which align with recommendations students have identified as critical to their career development. Students and young researchers are crucial and generally unrepresented stakeholders in these discussions, particularly as their futures are dependent on funding levels.

As emerging scientists and researchers, we believe the following recommendations are critical to the success of Canadian students, researchers, and scientists:

1. Increase funding for investigator-led direct project grants as recommended by the FSR
2. Increase value and consistency in funding for graduate and post-doctoral awards as recommended by the FSR
3. Invest in critical skills training for trainees and continue supporting work-integrated training programs through Mitacs
4. Promote diversity and gender equity by providing STEM education and training to underrepresented populations

As young researchers training to be Canada’s next generation of scientists, innovators, and professionals, we have been encouraged to see Prime Minister Trudeau’s government take meaningful steps toward fulfilling their commitment to supporting scientific research excellence in Canada^{1,2,3,4,5}. We commend the government for the infusion of federal funds into various targeted, priority research programs in the 2017 budget, in an effort to drive economic growth through innovation. However, the main challenge facing today’s Canadian research ecosystem is the lack of support for investigator-led fundamental research.

We, along with the rest of Canadian science community, were especially heartened by the decision to commission an Advisory Panel on Federal Support for Fundamental Science. As stated in the 2017 budget, “*findings from the review will help maintain and strengthen Canada's international standing in fundamental science and ensure that our scientists have the tools, training and support needed to excel globally*”⁶. With the release of the Fundamental Science Review (FSR) in April of this year, the panel led by Dr. David Naylor laid out 35 clear recommendations to strengthen the foundations of Canadian research, including improving coordination and oversight of funding agencies, promoting diversity and equity, redressing the current funding imbalance between priority-driven and independent research, reinvigorating the trainee awards, and increasing federal research funding by \$1.3 billion over 4 years. We join the Canadian scientific community in overwhelmingly supporting the findings of the Fundamental Science Review, and call for the recommendations to be implemented in full.

In the 2015 federal election, young voter turnout was high, particularly among those enrolled in post-secondary education (Fig 1)⁷. **Young Canadian researchers – including graduate students and trainees – are directly and especially impacted by the state of fundamental research funding** because it supports our training in research and critical transferable skills, enables us to be competitive on the international stage, supports our career-building process,

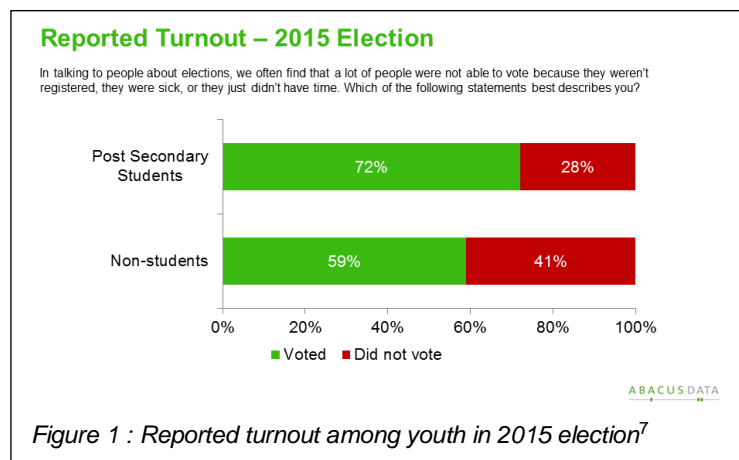
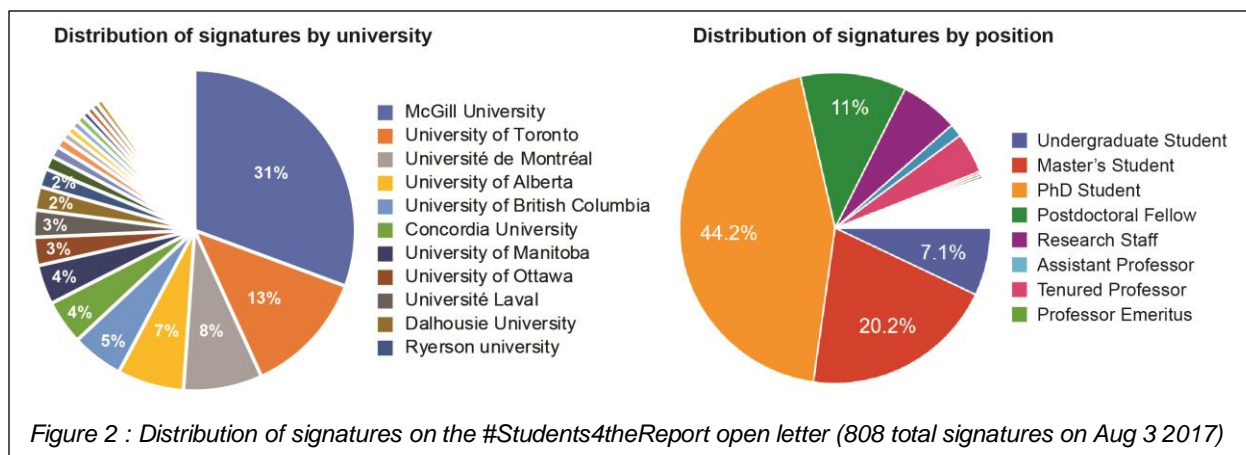


Figure 1 : Reported turnout among youth in 2015 election⁷

promotes expansion of diversity from the student population to leadership levels, and fosters a curiosity-driven society in which we can build a brighter future. Students and young researchers are critical, and often unheard, stakeholders in how the landscape of federal support for fundamental research evolves in the short and long term, and our voices must be included in these key discussions.

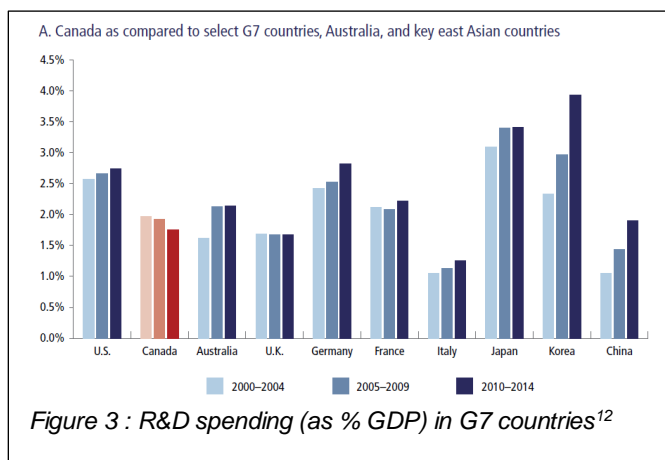
[We have written an open letter](#)⁸ in support of the recommendations of the FSR, on behalf of Canadian students and research trainees, to Prime Minister Trudeau and Ministers Morneau, Duncan, and Bains. This open letter was published in English and French on July 10, 2017, and has to date collected over 800 signatures from research trainees and those in the research community who support the student perspective on this important issue, from 60 academic institutions across Canada (Fig. 2). This campaign, under the hashtag **#Students4theReport**, has also received widespread support on social media.



Funding discovery research is important for Canada's future

A cornerstone of the Budget 2017 was the *Innovation and Skills Plan for Helping Canadians Succeed in the new Economy*⁹, which notably highlighted that Canada's OECD rankings demonstrated the potential to become a global leader in innovation¹⁰. This plan has led to prioritized initiatives which, indeed, promise to support the growth of Canadian innovation - including the development of innovation superclusters⁵, artificial intelligence⁴, and clean energy developments¹¹. While these are excellent initiatives, it remains critically important to adequately support curiosity-based research, as innovation is impossible without discovery and new scientific knowledge.

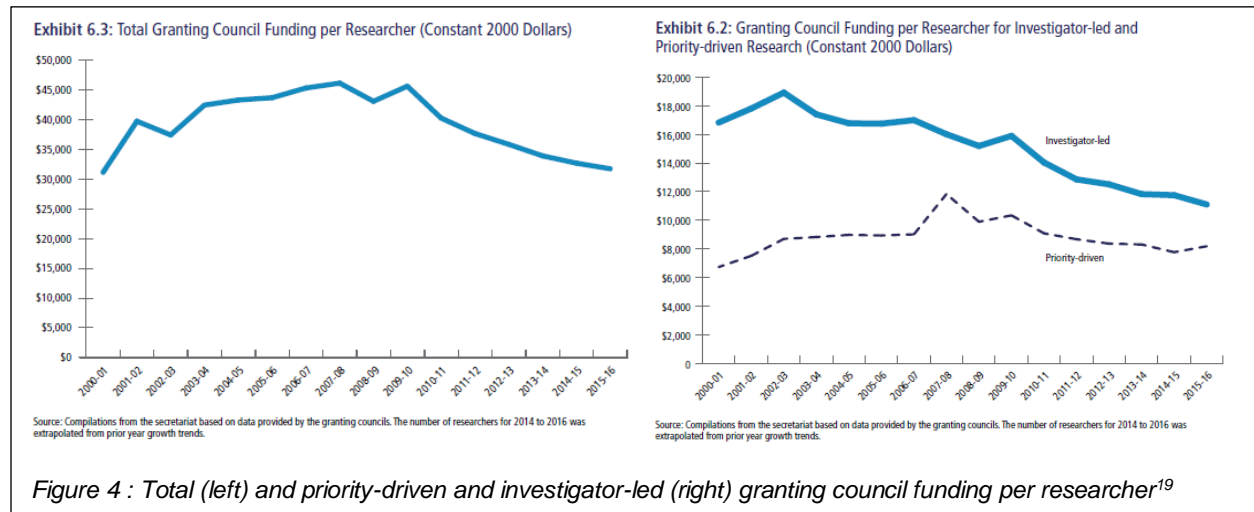
However, OECD has also shown that Canada has fallen behind in its support of research compared to our peer nations. Not only is Canada the only G7 country where R&D spending (as percentage of GDP) has declined in the last decade (Fig 3)¹², we are no longer among the top 30 nations in total research spending¹³. This decline jeopardizes Canada's competitiveness in research and innovation on the international stage. We applaud this government for taking steps to alleviate the deficit, including a notable increase in tri-council funding in the 2016 budget, however it remains that the



downward trend will continue without a significant reinvestment in discovery research. **We strongly recommend that the government of Canada implement the funding increase recommended in the FSR, an increase of 37% over 4 years, which will restore federal annual spending to 2007 levels¹⁴.** This would be a crucial step in reaffirming the government's commitment to research excellence in Canada, a cornerstone of our economy. Furthermore, and of equal importance, the FSR highlights the need to remedy the prolonged funding imbalance between priority-driven research and independent, investigator-led fundamental research¹⁵.

At minimum, the proposed \$485 million dollar increase in direct project funding¹⁶ would alleviate the pressure on struggling researchers, their staff, and their trainees. Indeed, a major portion of research grant dollars are responsible for job creation and training¹⁷; increased federal support for fundamental

research creates good jobs for skilled professionals¹⁸, thereby helping to grow the Canadian economy and middle class. However, researchers have seen a progressive decrease not only in granting council funding per researcher (Fig 4)¹⁹ but also in grant application success rates given that research funding has not increased proportionally to the number of applicants in the last decade²⁰. In this funding climate, laboratories and research institutes cannot continue to operate state-of-the-art facilities or employ the highly trained research staff needed to innovate.



Investing in young people through fundamental research trains Canada's next generation of leaders in science and innovation



We have an opportunity to be one of the most innovative and competitive countries in the world. To achieve that goal, we need a workforce that continues to be among the most skilled in the world. Attracting investment and talent to Canada will be key, along with taking concrete steps to equip Canadians with the skills they need to get the most out of an innovation-driven economy.”¹⁰ – **Budget 2017**

We are thrilled that this government is committed to promoting STEM to young Canadians, and we commend the continued funding for programs that support hands-on STEM learning experiences for youth, including those from underrepresented groups^{21,22}. Initiatives that promote coding and digital skills in young people will undoubtedly help in contributing to the modern economy.

“*Young Canadians are curious, talented, entrepreneurial and well-educated — traits that make them well-positioned to deliver the next great breakthrough in [STEM]*”²². However, in order for Canada’s investments in STEM education to come to fruition, there must also be robust and direct support for training at the post-secondary level. The number of scholarships and fellowships awarded by the federal granting councils has not kept pace with the increased enrollment in graduate programs nor inflation²⁰. The best way to ensure the development of a skilled and productive workforce that contributes to Canada’s stated science and innovation goals is to provide consistent funding to trainees and early career researchers. Fluctuations in funding hit students and post-doctoral fellows the hardest, resulting in job loss, inability to network, inability to perform crucial experiments, and in some cases forced early graduation. All of these consequences are crippling to the career development of young researchers. **We urge the government to recommit to appropriate scholarship and fellowship funding through the granting councils by increasing spending by \$140 million over 4 years, as recommended by the**

FSR. This should include increases in both value and duration of awards, as well as total trainees awarded.

Several reports^{23,24} have indicated that students are increasingly pursuing careers outside of academic research, due at least in part to the observed lack of funding²⁵. As such, the graduate degree functions also as a training program for advanced vocational and professional skills. Fundamental research funding that goes toward supporting students provides training opportunities to an entire generation of talented students who otherwise may not have the means to pursue research or to develop critical skills which can accompany a graduate degree; these include project management, self-directed learning, leadership, big data analysis, digital literacy, creative problem solving, effective communication, and entrepreneurship. **As we previously recommended in a white paper²³ on student perspectives on STEM education in Canada, investments should be made to ensure that students receive direct training in these critical skills as part of their curricula.** Students are not only the next generation of scientists, but also the next generation of skilled professionals across the public and private sectors. We applaud Budget 2017 which took great strides towards equipping young Canadians with the practical work experience required for smooth transitioning into the workforce by funding Mitacs co-op placement and work-integrated learning programs²⁶.

Training and educating young Canadians promotes diversity and equity

While there have been encouraging trends in health and social sciences, women are still underrepresented in physical sciences, computer science, engineering, and mathematics²⁷. Indigenous peoples, visible minorities, and people with disabilities still face significant barriers in choosing and succeeding in STEM fields^{28,29}. Providing STEM education and training to diverse populations enables Canada to draw from the largest pool of talent possible, developing a workforce powered by diverse backgrounds, knowledge, and ideas. We applaud the 2017 budget's support of programs like PromoScience, which will bring hands-on education to groups that are traditionally underrepresented in STEM fields. In addition, **we recommend that the government support and work with organizations like Let's Talk Science, who are already doing great work in bringing STEM education to underserved and remote communities.**

It's important to point out that supporting students through fundamental research also supports diversity. Students are a hugely diverse population. Within our academic departments, we not only share our labs and offices with colleagues of all cultural backgrounds and from all parts of Canada, but also with international students from across the globe^{30,31}. Women now outnumber men in both undergraduate and graduate programs in some disciplines, while the ranks of tenured professors are still dominated by men^{29,32}. **Reinvigorating scholarship and fellowship programs that propel the careers of student researchers, as recommended by the FSR, promotes diversity and equity beyond the student body and into the professoriate and leadership positions in other sectors.**

Final considerations

We commend Budget 2017 on supporting the establishment of the Chief Science Advisor position. Having worked closely with the Chief Scientist of Québec Rémi Quirion and his student group in recent years, we are thrilled that office of the CSA will also include a student group. We look forward to fruitful discussions with the upcoming Chief Science Advisor and his/her team.

References

1. Her Majesty the Queen in Right of Canada (2016, March 22) Growing the middle class: the 2016 Canadian Federal Budget, p113. <http://www.budget.gc.ca/2016/docs/plan/toc-tdm-en.htm>
2. Memorandum of Agreement Between the Treasury Board and the Professional Institute of the Public Service of Canada with Respect to Scientific Integrity (2016, Dec 8). https://www.pipsc.ca/portal/page/portal/website/.../moa_scientific_integrity_en.pdf
3. Statistics Canada (2015, Nov 6) Statement on the 2016 Census of Population and the Mandatory Long Form. http://www.statcan.gc.ca/eng/about/smr09/smr09_056
4. Department of Finance Canada (2017, March 30) Growing Canada's Advantage in Artificial Intelligence. <http://www.fin.gc.ca/n17/17-026-eng.asp>
5. Government of Canada (Accessed 2017, June 28) Funding to develop and grow business-led innovation superclusters in Canada. <https://www.canada.ca/en/innovation-science-economic-development/programs/small-business-financing-growth/innovation-superclusters/funding-superclusters.html>
6. Her Majesty the Queen in Right of Canada (2017, March 22) Building a strong middle class #Budget 2017: The 2017 Canadian Federal Budget. ScienceBudget 2017 Proposal: Fundamental Science Review, p88. <http://www.budget.gc.ca/2017/docs/plan/toc-tdm-en.html>
7. Canadian Alliance of Student Associations (2016, April 19) The Next Canada: Politics, political engagement, and priorities of Canada's next electoral powerhouse: young Canadians. <http://abacusdata.ca/the-next-canada-politics-political-engagement-and-priorities-of-canadas-next-electoral-powerhouse-young-canadians/>
8. Science & Policy Exchange (2017) An open letter on the student perspective of the Fundamental Science Review #Students4theReport. <http://www.sp-exchange.ca/students4thereport/>
9. Her Majesty the Queen in Right of Canada (2017, March 22) Building a strong middle class #Budget 2017: The 2017 Canadian Federal Budget, Chapter 1 Skills, Innovation and Middle Class Jobs, p43-11. <http://www.budget.gc.ca/2017/docs/plan/toc-tdm-en.html>
10. Her Majesty the Queen in Right of Canada (2017, March 22) Building a strong middle class #Budget 2017: The 2017 Canadian Federal Budget, p19.. <http://www.budget.gc.ca/2017/docs/plan/toc-tdm-en.html>
11. Her Majesty the Queen in Right of Canada (2016, March 22) Growing the middle class: the 2016 Canadian Federal Budget, p150. <http://www.budget.gc.ca/2016/docs/plan/toc-tdm-en.htm>
12. Advisory Panel for the Review of Federal Support for Fundamental Science (2017) Investing in Canada's future: strengthening the foundations of Canadian research, p31.
13. Advisory Panel for the Review of Federal Support for Fundamental Science (2017) Investing in Canada's future: strengthening the foundations of Canadian research, p30. <http://www.sciencereview.ca/eic/site/059.nsf/eng/home>
14. Advisory Panel for the Review of Federal Support for Fundamental Science (2017) Investing in Canada's future: strengthening the foundations of Canadian research, p151. <http://www.sciencereview.ca/eic/site/059.nsf/eng/home>
15. Advisory Panel for the Review of Federal Support for Fundamental Science (2017) Investing in Canada's future: strengthening the foundations of Canadian research, p115. <http://www.sciencereview.ca/eic/site/059.nsf/eng/home>
16. Advisory Panel for the Review of Federal Support for Fundamental Science (2017) Investing in Canada's future: strengthening the foundations of Canadian research, p154. <http://www.sciencereview.ca/eic/site/059.nsf/eng/home>
17. Advisory Panel for the Review of Federal Support for Fundamental Science (2017) Investing in Canada's future: strengthening the foundations of Canadian research, p139. <http://www.sciencereview.ca/eic/site/059.nsf/eng/home>
18. Statistics Canada (2013) Table 358-0166 Federal personnel engaged in science and technological activities, by major departments and agencies. <http://www5.statcan.gc.ca/cansim/a26?lang=eng&id=3580166>
19. Advisory Panel for the Review of Federal Support for Fundamental Science (2017) Investing in Canada's future: strengthening the foundations of Canadian research, p113-114. <http://www.sciencereview.ca/eic/site/059.nsf/eng/home>
20. Global Young Academy (2017) Restoring Canada's Competitiveness in Fundamental Research: The View from the Bench, p12-31. <https://globalyoungacademy.net/wp-content/uploads/2017/06/GYA-2017-FundResearchReport-LoRes.pdf>
21. Her Majesty the Queen in Right of Canada (2017, March 22) Building a strong middle class #Budget 2017: The 2017 Canadian Federal Budget, p72. <http://www.budget.gc.ca/2017/docs/plan/toc-tdm-en.html>
22. Her Majesty the Queen in Right of Canada (2017, March 22) Building a strong middle class #Budget 2017: The 2017 Canadian Federal Budget, p74. <http://www.budget.gc.ca/2017/docs/plan/toc-tdm-en.html>
23. Science & Policy Exchange (2016, Nov 7) Student perspective of STEM education in Canada. <http://www.sp-exchange.ca/news/STEM-White-Paper/>
24. Global Young Academy (2017) Restoring Canada's Competitiveness in Fundamental Research: The View from the Bench. <https://globalyoungacademy.net/wp-content/uploads/2017/06/GYA-2017-FundResearchReport-LoRes.pdf>
25. The Conference Board of Canada (2015) Inside and Outside the Academy: Valuing and Preparing PhDs for Careers. <http://www.conferenceboard.ca/e-library/abstract.aspx?did=7564>
26. Her Majesty the Queen in Right of Canada (2017, March 22) Building a strong middle class #Budget 2017: The 2017 Canadian Federal Budget, p60. <http://www.budget.gc.ca/2017/docs/plan/toc-tdm-en.html>
27. Canadian Council of Academies (2012) Strengthening Canada's Research Capacity: the Gender Dimension. <http://www.scienceadvice.ca/en/assessments/completed/women-researchers.aspx>
28. Her Majesty the Queen in Right of Canada (2017, March 22) Building a strong middle class #Budget 2017: The 2017 Canadian Federal Budget, p229. <http://www.budget.gc.ca/2017/docs/plan/toc-tdm-en.html>
29. Advisory Panel for the Review of Federal Support for Fundamental Science (2017) Investing in Canada's future: strengthening the foundations of Canadian research, p93. <http://www.sciencereview.ca/eic/site/059.nsf/eng/home>
30. University Affairs (2017) Why Canada has become a destination of choice for international graduate students. <http://www.universityaffairs.ca/opinion/in-my-opinion/canada-become-destination-choice-international-graduate-students/>
31. Statistics Canada (2016, Oct 20) International students in Canadian Universities, 2004/2005 to 2013/2014. <http://www.statcan.gc.ca/pub/81-599-x/81-599-x2016011-eng.pdf>
32. Statistics Canada (2010) University enrolment, by sex, registration status and program type, Canada and provinces, 1998/1999, 2003/2004 and 2008/2009. <http://www.statcan.gc.ca/pub/81-582-x/2010004/tbl/tbld1.5-eng.htm>
33. Peterson Institute for International Economics (2016, Feb) Is Gender Diversity Profitable? Evidence from a Global Survey. <https://piie.com/publications/wp/wp16-3.pdf>