UNIVERSITY OF
TORONTO

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Executive Summary

Canada has entered a new era of fiscal constraint. The federal government has clearly signalled that expenditures must be closely managed to prevent the deficit from becoming chronic. More than ever, Canada must employ a strategic lens as it prioritizes to ensure the health and prosperity of Canadians in the near and long term. Canada must remain focused on obtaining maximum benefit from its investments.

In this context, it is important to note that the federal government's support for universities pays significant dividends. These returns are measured by the highly-skilled graduates who are applying new knowledge and skills to the challenges of a changing global economy; by new spin-off companies and intellectual property that exploit neglected niches of traditional sectors; and by the services universities provide to small and large enterprises that cannot afford the specialized experts and infrastructure that can be found on our campuses.

These benefits are critical to Canada's future, for they are the very ones that will allow the country to overcome what several independent reports cite as the greatest long-term threat to our quality of life: our lagging productivity. Canada needs to tap its innovation potential, and it needs to cultivate the talent, ideas and networks to do it.

The federal government has a key role to play in sustaining the economic recovery and creating quality jobs by supporting the country's innovation system. The University of Toronto recommends that in Budget 2012 the Government of Canada:

- Maintain funding to the **Granting Councils**
- Reinvest in the **Canada Foundation for Innovation**
- Fully support the **Institutional Costs of Research**

Canada's prospects

Canada weathered the recent global economic downturn relatively well, but we face challenges over the long term. As reported by the Council of Canadian Academies, Canada's labour productivity has fallen from more than 90% of the US level in 1984 to 76% in 2007. Canadian workers now produce less wealth than their American counterparts. This downward trajectory means Canada is on course to become less prosperous, which cannot but impact Canadians' quality of life.

Aware of this long-term threat, and the role that federal support for innovation will play in addressing this issue, the Government of Canada has recently undertaken a number of initiatives to curb this trend. These include the establishment of the Science, Technology and Innovation Council, consulting Canadians to develop a Digital Economy Strategy, and launching a formal Review of Federal Support to Research & Development.

Much of the search for solutions has focused on disappointing R&D performance by industry. Canadian businesses do not invest enough in research or in new equipment, and venture capital to sustain early stage enterprises is scarce. These are significant challenges which rightly deserve the government's focused attention. What has received relatively less attention is Canada's successful track record of research carried out by its post-secondary education sector.

An outstanding return on investment

By all indications, Canada's universities have momentum and can now be said to be internationally competitive, thanks in large part to recent federal investments in advanced education and innovation.

The Government of Canada's Knowledge Infrastructure Program (KIP) will have a lasting impact at Canada's universities and colleges. The University of Toronto completed three successful KIP projects which will allow us to respond to the fast-growing demand for academic spaces in our region. For instance, the new Instructional Centre at University of Toronto Scarborough will increase academic space by 25% on that campus, a huge boon to eastern Toronto and surrounding communities. The Instructional Centre at University of Toronto Mississauga will likewise add much needed teaching space, and the Centre for Innovation in the Canadian Mining Industry will facilitate the University's links to one of Canada's most important sectors.

Through the Canada Excellence Research Chairs program, the University of Toronto was able to attract two international leaders in the fields of Integrative Biology and Structural Neurobiology. The appointments of Professors Fritz Roth and Oliver Ernst add significantly to Toronto's reputation as one of North America's top biomedical research clusters. And with the Vanier Canada Graduate Scholarships and the new Banting Postdoctoral Fellowships, we have exceptional new incentives by which to draw the brightest young minds to find solutions to Canadian problems.

By any number of metrics, Canada's research-intensive universities are classed alongside some of the world's most prestigious institutions. For instance, the University of Toronto and its research partner hospitals spun off 24 companies between 2005-06 and 2007-08, the fourth best record among public universities in North America. Similarly, U of T researchers are ranked first for the number of publications and citations among North American public universities, two key indicators of research productivity.

Another sign that investment in Canada's post-secondary system is paying dividends is growth in advanced graduate degrees. A recent report by the Science, Technology and Innovation Council shows that graduation rates in master's and doctoral science and engineering degree programs have risen substantially. Between 2005 and 2008, doctoral degrees in engineering grew at a rate of 42.1%, and in the sciences the growth of PhD degrees was 63.7%. This is good news for Canada, as several studies have lamented an unremarkable level of attainment of advanced degrees as a contributing factor to Canada's lacklustre productivity.

Canada's successful innovation ecosystem

Canada has a robust legacy of programs to support innovation at its universities. This includes the Granting Councils (Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada (NSERC), Social Sciences and Humanities Research Council (SSHRC)) which support the operating costs and salaries of student researchers, and the Canada Foundation for Innovation (CFI) which provides the modern tools researchers require to make meaningful contributions to science and industry. Together, these and other programs create a vibrant innovation ecosystem in which researchers, students and partners in industry can succeed.

The effect of these different tracks of funding is cumulative, and pinpointing credit for success can be difficult. The case of U of T student Vincent Cheung is enlightening. Vincent, who is pursuing a PhD in Computer Engineering, recently won the 2010 Global Graduate Student Entrepreneur of the Year award, a competition for university students taking a full course load while running a revenue-generating business. His digital start-up, Shape Collage, has been downloaded more than a million times and generates six-figures in annual revenues.

The University of Toronto is fortunate to have him, but it was not luck that attracted Vincent to Toronto. He chose U of T over Stanford University in part so that he could work with Professor Brendan Frey, a top researcher with strong links to leading industrial laboratories. Professor Frey, in turn, is a prime example of a researcher who has flourished in Canada, making important contributions to science and industry, thanks largely to federal support. The Canada Research Chair and former NSERC EWR Steacie Fellow has made significant discoveries in fields ranging from computational biology to computer vision. His success relies on having a properly equipped laboratory, funded by the Canada Foundation for Innovation. CFI also provides a superb research environment to prepare his students to become Canada's next generation of innovators, ready to fill tomorrow's highly-skilled jobs, or even, as in the case of Vincent, to create their own.

The spirit of entrepreneurship is also thriving in the lab of Professor Cynthia Goh, an accomplished Chemist specializing in instrumentation. Professor Goh is one of Canada's strongest advocates for the transfer of scientific knowledge into products for the benefit of the Canadian public. Inventions in her laboratory have led to three start-up companies: Axela Biosensors, a fast growing company with 35 FTEs which sells analytical equipment for health researchers in universities and pharmaceutical companies; Vive Nano, which employs 14 FTEs who are developing a platform to create nanoparticles for a wide range of applications, including crop protection; and Dalenyi Biosurfaces, whose product creates enormous efficiencies for life sciences researchers working in fields ranging from cancer research to diagnostics.

Professor Goh takes her role as an educator as seriously as her role as an inventor. In 2004 she developed the Entrepreneurship 101 course which has grown to become Toronto's leading entrepreneur training lecture series, now offered to thousands at the MaRS Discovery District. To top this off, she recently organized Techno2010 and Techno2011, intensive summer training programs

for scientists who want to build tech-based businesses. The early results are promising: attendees of the inaugural class of 2010 have already formed ten new companies, including the aforementioned Dalenyi Biosurfaces.

Professor Goh's success is firmly grounded in the quality of her research, which has flourished in a supportive research environment thanks to several strands of government funding, critically including NSERC and shared CFI resources. More and more, her research program has been funded through industrial partnerships with her start-ups, a virtuous circle by which her research program has become increasingly self-sustaining.

Recommendations

The success stories surrounding Professors Frey and Goh are but two of hundreds of such examples at institutions across the country. Canada has built a highly effective innovation system on its campuses. However, we continue to face stiff global competition, not only from traditional R&D leaders in the USA and Europe, but from emerging economies like China, India and Brazil that are investing more than ever in innovation.

Canadian universities will be key to government's quest to sustain Canada's economic recovery and create quality jobs. Our innovation system has built up significant momentum, but it will soon slow without federal support to fuel it.

Granting Councils

The Granting Councils (CIHR, NSERC and SSHRC) are the lifeblood of university research. They keep Canadian labs running by supporting day-to-day operations, providing the stable base upon which forward progress is built. A huge proportion of these grants support the learning and research opportunities of graduate students and post-doctoral fellows, including the many non-personnel programs like NSERC's flagship Discovery Grant program. For instance, in 2006-07, established researchers holding a Discovery Grant allocated in the range of 43-48% of their funds to the salaries of students and fellows. These grants allow talented young people to work alongside their professors in the lab, to apply themselves to real problems and make their own discoveries, to live up to Canada's innovation potential.

Of all the federal investments in academic research, the Granting Councils together comprise the keystone that supports success throughout the system. We greatly appreciate the new investments in the Granting Councils in recent budgets, and urge the Government of Canada to continue this trend.

Canada Foundation for Innovation

As we hope we have demonstrated, the effect of federal support for research is cumulative, producing an entire ecosystem in which researchers thrive. While the University of Toronto appreciates the growth in funding to the Granting Councils in recent budgets, we are concerned about the uncertain future of support for the Canada Foundation for Innovation.

From 2005-06 to 2010-11, CFI infrastructure awards averaged roughly 19% of Granting Council funding. Between 2010-11 and 2013-14, this is expected to fall to 6% (this figure excludes the Major Sciences Initiative which, by its nature, will be very unevenly distributed among universities). This contrasts sharply with competitor jurisdictions. In the United States, approximately 24% of the National Science Foundation's budget is devoted to research infrastructure.

CFI allows new researchers to outfit their labs and established researchers to remain productive. It provides the facilities upon which entire teams of Canadian scientists climb to internationally competitive levels and which entice businesses to become collaborators. Without new investment in adequate infrastructure, many researchers will have no choice but to move to where the tools are. We recommend that Budget 2012 include a reinvestment in CFI to bring it up to 15% of Granting Council funding.

Institutional Costs of Research

Universities do more than just provide a space for research to happen. They oversee project administration and accountability reporting, ensure regulatory and safety compliance, assist in the management of intellectual property and commercialization, and provide researchers with sophisticated facilities and computer networks. These institutional costs, also commonly known as indirect costs, amount to approximately 52% of direct research costs. For every $1 spent on research, 52 additional cents must be spent by the university to support that research. Right now the average reimbursement rate from the federal Granting Councils for each grant through the Indirect Costs Program is about 22%. At larger institutions, such as U of T, it is even less. The University of Toronto only receives about 18 cents on each dollar. This creates a perpetual shortfall, whereby the University must draw upon its operating budget—i.e., tuition fees and provincial educational grants—to essentially subsidize federally-supported research. While research is fundamental to the greater prosperity of Canada, our pursuit of this goal should not come at the expense of every student. We recommend that Budget 2012 rectify this unnecessary compromise by supporting the full institutional costs of research.

Conclusion

Despite the projected deficit and persistent issues with Canada's competitiveness and productivity, there are many reasons to be optimistic. The past few years have shown that Canada has enviable resilience.

Our future prosperity will depend on the maturation of our entire innovation system, particularly in business-led R&D and investment. However, Canadian universities will remain a critical piece of the innovation puzzle. Federal support for academic research pays dividends in the form of the people, partnerships and knowledge that will collectively lead to long-term solutions.