

**Council of Ontario Universities**  
**Position Paper on Graduate Education in**  
**Ontario**

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**COUNCIL OF**  
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**CONSEIL DES**  
**UNIVERSITÉS DE L'ONTARIO**

## EXECUTIVE SUMMARY

Ontario universities welcome the major investments that the Province of Ontario has made to expand graduate education under its *Reaching Higher* plan; as well as its commitment to a further increase of 6,000 new graduate student spaces by 2016, under the new *Putting Students First* plan for postsecondary education.

This paper proposes a framework for graduate expansion that will help achieve the province's goals to expand professional and research-based graduate programs to support innovation in Ontario's knowledge-based economy, and improve the province's competitive position globally.

The province's universities seek a dialogue with the provincial government to determine the most efficient and equitable way to allocate the announced 6,000 spaces among Ontario universities and, therefore, propose the following principles to guide the allocation process:

1. All Ontario universities should benefit.
2. Allocations should be based on criteria in a transparent process.
3. Future spaces should be fully funded.
4. Funding for spaces should be fungible across master's and doctoral programs.
5. The Ministry should set multi-year targets, and adapt targets where warranted.
6. The Ministry should allow flexibility in the timing of implementation of expansion.
7. Allocations should be accompanied by increases in financial support to graduate students.
8. The provincial government should clarify its priorities for program expansion.

Ontario universities recommend that the provincial government open a dialogue about further investment in international graduate students.

In addition to creating a successful framework for funding graduate growth, Ontario universities recommend an expansion of graduate education in Ontario beyond the announced 6,000 spaces. While Ontario is a world leader in undergraduate education, the province is lagging behind other jurisdictions in graduate education. To compete in the knowledge-based global economy, Ontario needs to close these gaps. Moreover, the province needs to address the increasing demand for graduate education as projected by recent growth trends and future population growth.

## INTRODUCTION

The major investments that the Province of Ontario has made to expand graduate education under its *Reaching Higher* plan are welcomed, as is the government's commitment to a further expansion of graduate spaces to 2016.<sup>1</sup>

Ontario universities support the province's goals to expand professional and research-based graduate programs that, in turn, support innovation in Ontario's knowledge-based economy and improve the province's competitive position globally. Ontario universities produce graduate students who will lead the province's economic and social development for many years to come. Graduate programs in Ontario provide students with critical skills to drive the economic and social innovation agenda, and contribute to the strength of the province's multicultural democratic society.

This paper sets out Ontario universities' proposals for a framework on graduate expansion that will help achieve these goals. These proposals, if accepted by the province, will significantly help to implement the already announced expansion plans, and will result in investments that address the needs of Ontario's knowledge-based economy and innovation agenda.

This paper:

- situates the proposals for graduate expansion framework in a broader context
- proposes a framework for implementation of the current expansion
- calls for new investments in graduate education that match the demands for graduate spaces and the needs of Ontario economy

## GRADUATE EDUCATION AND THE FUTURE OF ONTARIO

Currently, Ontario universities educate more than 52,000 graduate students. More than 39,000 of them are eligible for government funding.<sup>2</sup> Over the last decade, the number of graduate students funded by the province has increased by 45 per cent, adding 17,500 new graduate students to the sector.

The importance of graduate students in Ontario cannot be overstated. Graduate education is crucial for sustaining and developing Ontario's competitive position in the global, knowledge-based economy. Graduates of advanced research and professional programs in the province develop skills that are not only required in the current marketplace, but are also necessary to innovate and create future enterprises in the fields of business, science, arts and culture. Graduate students of today will become leading innovators of tomorrow.

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<sup>1</sup> On July 12, 2011, MTCU announced that \$27M will be available for expansion of new graduate spaces in 2012-13, growing to \$54M in 2013-14. Ministry staff cannot confirm the allocation for 2014-15 and 2015-16 (the last two years of the expansion), because this period is beyond the government's approved fiscal plan. The Ministry has assumed, however, that growth in spaces will be linear across the four years, indicating a likely additional commitment of approximately \$108M by 2015-16 (over the funding level of 2011-12).

<sup>2</sup> In order to provide a proper comparison to MTCU announcement of 6,000 spaces for graduate expansion, full-time equivalent (FTE) counts were used, based on correspondence with MTCU staff.

Ontario universities create thinkers who will create the jobs of tomorrow and propel Ontario's economy into the future. Graduate students will be connected to global research and business networks that will help to strengthen Ontario's economy in the context of economic globalization. But the benefits of graduate education extend beyond its impact on economy. Graduate education is also central in producing educated citizens who can promote and defend democratic values and ideals.<sup>3</sup>

Graduates with advanced training contribute significantly to the local and global economy. The wage premiums and employment opportunities are much greater for those who hold master's and doctoral degrees in comparison to those with lower levels of education.<sup>4</sup> As newly graduated graduate students join the workforce, they are not only able to contribute higher taxes to the province, but also to develop businesses that provide employment and economic benefits to many others.

Graduate education and university research play an important role in promoting local economic growth and development. Research done by faculty and graduate students in each university is often a key to thriving local communities. The economic success of many local communities is inextricably linked to universities' ability to attract, support and retain the knowledge workers, who contribute to the innovation economy at the local and global levels.<sup>5</sup> The availability of highly skilled labour attracts industrial laboratories and other businesses, particularly those based on the fields of science and technology.<sup>6</sup>

See Appendix I for additional contributions of graduate education to Ontario's economy and society.

Moreover, robust and successful graduate programs attract many international students, whose presence is critical for both international academic research and the advancement of the global economy outside academia. International graduate students contribute to Ontario's economy while they study here and after completing their studies.<sup>7</sup> According to a recent survey of international students, more than half indicated that they are planning to apply for permanent residency in Ontario.<sup>8</sup> Thousands of students receive work permits to work in Ontario following their graduation.

## PRINCIPLES FOR GRADUATE EXPANSION

Ontario universities seek a dialogue with the provincial government to determine the most efficient and equitable way to allocate the currently announced 6,000 spaces expansion and prospective future expansions.

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<sup>3</sup> Council of Graduate Schools, *Graduate Education and the Public Good*, 2008.

<sup>4</sup> Justin Bayard and Edith Greenlee, *Graduating in Canada: Profile, Labour Market Outcomes and Student Debt of the class of 2005*, Statistics Canada, 2009.

<sup>5</sup> For one recent example among many, the McMaster Innovation Park being developed in Hamilton will bring together businesses and university researchers to work on various projects leading to commercialization of research. Hamilton Spectator, *Research = innovation = success; Robust, locally supported research is key to a thriving community - like Hamilton*, November 23, 2011.

<sup>6</sup> Hill, Kent, *University Research and Local Economic Development*, Arizona State University's Productivity and Prosperity Project, August 2006.

<sup>7</sup> Roslyn Kunin & Associates, Inc. (RKA, Inc.), *Economic Impact of International Education in Canada*, July 2009.

<sup>8</sup> Survey of International Students in Canada, 2009 (data for Ontario only).

***All Ontario universities should benefit.***

All universities offering graduate programs should be granted some portion of the new graduate spaces, consistent with the missions and strategic plans of each institution. This is not to recommend that the entire 6,000 spaces should be distributed on a proportional basis, but all universities should receive some benefit from the new spaces.

The allocation process should be forward-looking, allowing universities to articulate their different strengths, aspirations and evolving capacities that respect graduate education. Ontario universities welcome a dialogue with the province concerning how the implementation of strategic mandate agreements (announced by the Minister of Training, Colleges and Universities in May 2011) can support the allocation of graduate spaces, in the context of each university's mission, provincial priorities, the quality of programs and the ongoing differentiation of the Ontario university sector.<sup>9</sup>

***Allocations should be based on criteria in a transparent process.***

Proposals for graduate allocations should be evaluated by clearly established criteria. For proposals to be effective, and to ensure quality of submissions, the Ministry of Training, Colleges and Universities (MTCU) should publish the criteria that will be used for evaluation in advance of any proposal process. Establishing the criteria ahead of time will also provide for a fair and transparent process, in which all participating universities can be confident that their submissions will be adjudicated equitably.

***Future spaces should be fully funded.***

All new graduate spaces should be fully funded to support effective planning and, more importantly, to maintain the quality of the programs offered. Quality of graduate education is crucial to maintaining and improving Ontario's position in the global education market, and to support Ontario's economy. Maintaining the current funding level per space is necessary to protect the quality of graduate education in Ontario.

Since costs continue to increase in the postsecondary sector (as in other public sectors), increasing the funding per space to help meet a reasonable portion of the "cost of continuance" is also necessary to protect the quality of graduate education.<sup>10</sup>

***Funding for spaces should be fungible across master's and doctoral programs.***

Fungibility would allow universities to substitute funding that may have been provided for master's programs for programs at the PhD level and vice versa. Substitution is not expected to be on a one-to-one ratio, given the funding provided per level is not equal. Ontario universities recommend that MTCU offer maximum flexibility to create and deliver graduate programs that reflect demand, university capacity and program expertise. Graduate programming is dynamic and determined by many factors, including

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<sup>9</sup> Ontario universities recognize that an interim approach to allocations outside of Strategic Mandate Agreements (SMAs) may be needed for allocations in 2012-13, as the process for SMAs is developed.

<sup>10</sup> Funding for cost of continuance could be done through increased provincial grants or increases in tuition, or a combination of both measures.

response to market demand, recruitment of high-caliber students,<sup>11</sup> availability of research funding (which requires and supports graduate students), and recruitment of the best faculty. Flexibility in managing graduate program growth over time allows for effective planning that is responsive to changes in the economic and social environment, research funding, and availability of faculty and students: all while maintaining the highest quality of graduate education. By allowing fungibility, MTCU can support universities' response to market fluctuations (both on the demand-side and the supply-side) to deliver the most effective graduate programming.

*The Ministry should set multi-year targets, and adapt targets where warranted.*

As it did with the graduate growth targets under the Reaching Higher expansion, the Ministry should set targets that identify an end-state allocation at the end of a multi-year planning cycle and provide time for universities to achieve their targets. The Ministry should clarify the rules of the allocation at the outset of a planning cycle, including the rules concerning consequences where universities do not meet or exceed their planning targets at the end of the planning cycle. The rules of the allocation process should remain in place until the end of the cycle to support universities' long-term planning.

*Ontario universities recommend that the rules governing a planning cycle include the following:*

If a university fails to meet its enrolment targets during the course of a planning cycle – either by a large margin or through a sustained pattern of shortfall – MTCU could re-negotiate a new set of lower enrolment targets for the remaining years in the cycle. Where this occurs, the unfilled spaces should be reallocated to other universities that are willing and able to further increase graduate enrolments.

If a university achieves growth above the target that was agreed to by the province, the province would not commit to provide grants for growth above target and the university would accept the risk of unfunded spaces. The Ministry should be willing to re-open a negotiation with a university above its target for additional funded spaces, addressing (as it would in an initial allocation) demand for spaces, the university's mission and capacity, and provincial priorities. Allocation of additional spaces to a university above an initial planning allocation should not adversely affect access to spaces for other universities, except in the specific circumstances addressed above where the province is reallocating unfilled spaces.

It is possible that demand across the university sector will exceed MTCU's projection of overall demand during the planning cycle. In this instance, MTCU could revise institutions' targets (for example, with a percentage increase) or conduct a sector-wide allocation process for the new spaces.<sup>12</sup>

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<sup>11</sup> It is difficult to predict graduate enrolment on a single-year basis. There can be significant variability, for example, in the numbers of applications to programs from year to year, and in the ratio of acceptances to offers. This variability is often greater than in undergraduate programs.

<sup>12</sup> These principles of setting and adapting target levels of enrolment are recommended by the Council of Ontario Universities; see the *Framework for Planning and Funding of Enrolment*, June 2010.

***The Ministry should allow some flexibility in the timing of expansion.***

Ontario universities believe that flexibility in reaching the growth targets, set jointly by universities and MTCU, will be crucial in assuring long-term strategic objectives of the province and universities, without compromising quality. As described above in the section concerning fungibility, the expansion of existing graduate programs and the creation of new ones often depend on numerous factors, some of which are beyond universities' control. As a result, some universities might reach their targets earlier than others.

Where a university has not yet reached its targets, and can provide evidence that it will be able to reach its targets in a reasonable period of time, the Ministry should maintain its commitment to fund spaces up to the cap in future years.

As noted above, where a university does not meet its targets by a large margin or through a sustained pattern of shortfall, the Ministry could re-negotiate the target and reallocate any spaces made available by that re-negotiation to other universities.

***Allocations should be accompanied by increases in financial support to graduate students.***

Ontario universities encourage the provincial government to increase the number of graduate scholarships it supports (such as, the Ontario Graduate Scholarships) in keeping with its support for expanded graduate spaces, in order to help Ontario universities continue to attract excellent students. Ontario will continue to face competition from other provinces as well as from the United States, which provides generous financial support to graduate students, particularly doctoral students.

***The provincial government should clarify its priorities for program expansion.***

In June 2011, when MTCU announced its intention to establish 6,000 new graduate spaces until 2015-16, the announcement indicated that those new spaces will be concentrated in high-demand programs and programs that align well with provincial research priorities. If this approach is maintained, Ontario universities seek further clarification concerning the definition of high-demand programs and provincial research priorities.

Ontario universities are already responsive to market demand for specific graduate programs. The fastest growing graduate programs in the recent decade are Engineering and Applied Science, and Health Professions. These fields of study are well aligned with the government's policy goals of creating more graduate spaces in programs leading to careers in fields such as engineering, health and environmental studies.

Ontario universities propose that the government engage universities in a strategic dialogue about the province's priorities and universities' goals, as part of implementation of strategic mandate agreements.

We recommend that strategic mandate agreements form the context in which MTCU considers approvals of eligibility of new programs for funding. Strategic mandate agreements would address both the university's current strengths and its priorities for future expansion of programs. New programs that are well-aligned with a university's strategic mandate agreement should be approved as eligible for funding in an expeditious process (recognizing that funding eligibility does not impact the allocation of target

spaces). MTCU's more detailed program approval processes should be applied only where a university is proposing a new program substantively different from its current strengths, or in addition to priorities it has articulated in its strategic mandate agreement.

## **FUNDING FOR INTERNATIONAL GRADUATE STUDENTS**

Ontario universities recommend that the provincial government open a dialogue about investment in international graduate students.

The main goal of graduate expansion is to attract Ontario's best students to continue their education in Ontario universities. Both the provincial government and universities recognize that to remain competitive in attracting top students and to support Ontario's economic objectives, universities in the province must continue to expand enrolments of international graduate students.

Ontario lags behind Canada in attracting international students, particularly to graduate programs. In Ontario, only 15 per cent of graduate students are international students, in comparison to an average of 20 per cent for the entire country.<sup>13</sup>

Four provinces – Alberta, Saskatchewan, New Brunswick and Nova Scotia – fund international graduate students at the same rate as domestic students. Two provinces – British Columbia and Quebec – provide partial funding for international graduate students.

Ontario universities seek to open a dialogue with the provincial government about specific measures that would help attract international graduate students to Ontario. For example, the provincial government could consider expansion of the proportion of Ontario Graduate Scholarships that are made available to international students. The provincial government could consider funding a limited number of spaces (as part of the announced 6,000 spaces or in addition to them) for international graduate students, for example, to expand graduate programs in STEM disciplines, which attract a high proportion of international students.

## **INVESTMENT IN THE FUTURE OF GRADUATE EDUCATION IN ONTARIO**

In addition to creating a successful framework for funding graduate growth, Ontario universities propose to expand graduate education in Ontario beyond the announced 6,000 spaces.

As noted above, under the *Reaching Higher* plan, Ontario provided funding for more than 15,000 additional graduate spaces. As part of the allocation process, MTCU set targets for each institution with the goal of reaching end state in 2011-12. Ontario universities acknowledge that reaching specific targets has been challenging for some institutions. At the same time, other institutions grew above their target.

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<sup>13</sup> Data sources: OECD, *Education in Glance 2011: OECD Indicators* and Council of Ontario Universities (reference year - 2008).



These fluctuations emphasize the importance of long-term planning, as well as flexibility in timing of allocations and fungibility of allocated spaces. COU strongly encourages the province to consider the graduate expansion process not as separate expansion stages, but as one long-term strategic plan for universities, to address both the increasing demand for high-quality graduate education in Ontario and the crucial need for highly educated workforce in the knowledge-based global economy.

### **DEMAND FOR GRADUATE SPACES IS EXPECTED TO EXCEED 6,000 SPACES**

As the baby boom echo generation reaches the age of entrance to graduate programs, this cohort will become one of the fastest growing cohorts in the coming decade.<sup>14</sup> Combined with the demands of the economy for more advanced education and continuing trends in increasing postsecondary education participation rates, the boom echoers will drive the demand for graduate education in Ontario.

Graduate programs in Ontario universities have experienced continued growth over the last decade, averaging a 6.1 per cent annual increase in graduate students eligible for provincial funding.<sup>15</sup> There is no evidence that growth rates will slow over the next few years. If current growth rates continue, we project that Ontario will be adding almost 10,500 eligible-for-funding graduate students by 2015-16: 7,000 master's students and 3,500 doctoral students.<sup>16</sup> The enrolment projection model developed by the Council on University Planning and Analysis (CUPA) supports these projections.

### **ONTARIO IS LAGGING BEHIND THE REST OF THE WORLD IN GRADUATE EDUCATION**

Canada has traditionally performed very well in comparison to other countries on educational attainment.<sup>17</sup> Canada's leading position on educational attainment, however, can largely be attributed to undergraduate education. In contrast, the proportion of Ontarians with master's and doctoral degrees is considerably lagging behind the rest of Canada and other countries.

The following table sets out a comparison of the estimated proportion of people of a relevant age cohort that will attain a graduate degree in Ontario and in other jurisdictions, based on analysis by the Organisation for Economic Co-operation and Development (OECD).

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<sup>14</sup> The baby boom echo generation is the generation of children of the baby boomers. The oldest baby boom echo member is 29 years old now and the youngest is 15.

<sup>15</sup> It is important to note that the awarding of graduate degrees in Ontario is growing at the same pace as graduate enrolment. The increased levels of enrolment do not indicate that students take longer to finish their programs. Ontario universities successfully graduated 15,849 master's students and 2,306 PhDs in 2009. This represents an increase in more than 7,000 graduate degrees awarded in Ontario in comparison to 2001.

<sup>16</sup> This calculation discounts additional growth of the system for the year 2011-12. The last year for which enrolment data is available is 2010-11. Thus, from 2010-11 till 2015-16, the system will expand even further. MTCU has provided "bridge" funding to accommodate graduate growth for 2011-12.

<sup>17</sup> OECD, *Education in Glance 2011: OECD Indicators*, 2011.

*Projected graduation rates by country and level of study (2009)*

	Ontario <sup>18</sup> (%)	Canada (%)	United States (%)	United Kingdom (%)	OECD average (%)
Undergraduate degrees	45.7	38.9	37.8	39.7	37.8
Master's degrees	4.0	9.0	17.4	22.3	12.7
Doctoral degrees	0.4	1.2	1.6	2.1	1.5

Source: *Education at a Glance 2011: OECD Indicators and Statistics Canada*

Ontario's share in national GDP, population and university funding is about 40 per cent of the national total. In contrast, Ontario educates only 33 per cent of Canada's master's students.<sup>19</sup> Even though it educates the largest number of graduate students in Canada, Ontario ranks only 5<sup>th</sup> among the provinces with respect to the graduate students as a proportion of total university enrolment. Ontario graduate students comprise less than 14 per cent of all students (undergraduate and graduate students) in comparison to Quebec (23 per cent),<sup>20</sup> British Columbia (19 per cent), Alberta (19 per cent) and Newfoundland and Labrador (15 per cent). The proportion of graduate students in Ontario is also considerably below the average for the rest of Canada (18.5 per cent).

If Ontario's graduate enrolment in 2015-16 were at the current average of the rest of Canada, there would be approximately 50,000 more spaces (in contrast to the 6,000 spaces that the province has committed to fund).

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<sup>18</sup> COU's calculations based on OECD methodology. According to OECD definition: "Net graduation rates represent the estimated percentage of people from a specific age cohort who will complete tertiary education, based on current patterns of graduation." Similar methodology was constructed for Ontario. First, Ontario's graduation rates by level of study for 2009 were calculated. Then, the graduation rates at each level were divided by the population size of the relevant age group as defined by OECD for Canada. The data sources for graduation rates and population size are from *Statistics Canada*.

<sup>19</sup> HECQO, *Expanding Opportunities for Graduate Studies: The Recent Experience in Ontario*, 2011.

<sup>20</sup> Please note that the enrolment data on Quebec excludes CEGEP students. As a result, the percentage of graduate students is somewhat overestimated. However, given the significant percentage of graduate students in Quebec universities, the inclusion of CEGEP students will have a very small effect on interprovincial rankings.

*Interprovincial Comparisons of University Enrolment (2008)*<sup>21</sup>

	Graduate Students as a Proportion of Total University Enrolment (%)	Ratio of Graduate Students to Undergraduate Students
Quebec	23.0	0.30
British Columbia	18.5	0.23
Alberta	18.5	0.23
Newfoundland and Labrador	15.4	0.18
<b>Ontario</b>	<b>13.8</b>	<b>0.16</b>
Saskatchewan	12.9	0.15
New Brunswick	12.8	0.15
Manitoba	11.3	0.13
Nova Scotia	8.8	0.10
Prince Edward Island	4.5	0.05
Average for the rest of Canada (excluding Ontario)	18.5	0.23

Source: Council of Ontario Universities

Graduate students provide a valuable resource in supporting undergraduate education in institutions. However, the ratio of undergraduate and graduate students in Ontario is also very low. For each 100 undergraduate students, Ontario educates only 16 graduate students in comparison to the average of 23 students for the rest of Canada. Ontario lags behind four other provinces: Quebec (30), British Columbia (23), Alberta (23) and Newfoundland and Labrador (18).<sup>22</sup>

Research shows that despite the increased growth rate in graduate students in Ontario, the gap with the United States at the master's level has widened on a per capita basis. As of 2008, the United States produced twice as many master's graduates per 1,000 population in comparison to Ontario. Given the wage premiums of master's degree graduates over bachelor's degree holders, the gap with the United States likely contributes to Ontario's lower levels of productivity and innovation performance.<sup>23</sup>

To some extent, however, the US may be reaching its potential for growth. Over the last decade, graduate enrolment in the United States increased at a slower pace than in Ontario (3.3 per cent annual growth on average in the US versus 5.9 per cent in Ontario). This presents an opportunity to close the gap with the United States as Ontario's faster growth rates continue and the province supports this growth with additional funding (for trends in growth rates of specific programs, see Appendix II).

Another indicator that there is a great demand for graduate education is the different growth rate of applications versus enrolment. In the United States, over the past decade, the applications to graduate programs grew at the average annual rate of 5.7 per cent. The growth rate in applications has greatly

<sup>21</sup> Interprovincial comparisons are based on calculations of eligible and ineligible FTEs.

<sup>22</sup> The ratio of graduate students to undergraduate students has been increasing very moderately since 2000-01.

<sup>23</sup> Task Force on Competitiveness, Productivity and Economic Progress; *Prospects for Ontario's Prosperity*, November 2010.

outpaced the enrolment growth of 3.3 per cent on average, which indicates that the demand for graduate degrees exceeds the supply.<sup>24</sup>

If Ontario is to successfully compete in the global economy and create competitive advantage as an innovator in the knowledge-based economy, it must close these gaps.

## SUMMARY OF RECOMMENDATIONS

Ontario universities put forward three main recommendations for graduate education expansion and funding in Ontario.

1. Ontario universities propose the following principles to guide the allocation process of the announced 6,000 spaces:
  - a. All Ontario universities should benefit.
  - b. Allocations should be based on criteria in a transparent process.
  - c. Future spaces should be fully funded.
  - d. Funding for spaces should be fungible across master's and doctoral programs.
  - e. The Ministry should set multi-year targets, and adapt targets where warranted.
  - f. The Ministry should allow flexibility in the timing of implementation of expansion.
  - g. Allocations should be accompanied by increases in financial support to graduate students.
  - h. The provincial government should clarify its priorities for program expansion.
2. Ontario universities recommend that the provincial government open a dialogue about investment in international graduate students – for example, expansion of the proportion of Ontario Graduate Scholarships that are made available to international students, and/or funding a limited number of spaces (as part of the announced 6,000 spaces or in addition to them) for international graduate students to expand graduate programs in STEM disciplines.
3. In addition to creating a successful framework for funding graduate growth, Ontario universities recommend an expansion of graduate education in Ontario beyond the announced 6,000 spaces to address market demands and close gaps with other jurisdictions.

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<sup>24</sup> The data on graduate applications in Ontario is not available on a sector-wide level.

## APPENDIX I – THE CONTRIBUTION OF GRADUATE EDUCATION TO ONTARIO’S ECONOMY AND SOCIETY

The Natural Science and Engineering Research Council (NSERC) notes:

Advanced training in science and engineering is an integral part of university research and of NSERC’s mission to foster the discovery and application of knowledge. This training contributes to the availability of a highly skilled labour force, capable of thinking critically and creating and applying knowledge for the benefit of Canada. Individuals trained in science and engineering are ideally positioned to capitalize upon new ideas and technologies developed in Canada and elsewhere in the world, regardless of the sector in which they are employed. Professionals in science and engineering contribute to our national competitiveness and productivity, as well as to our understanding of the natural and physical environment and ourselves, leading to improvements in the standard of living and quality of life for Canadians.<sup>25</sup>

The Association of Universities and Colleges of Canada (AUCC) in its 2010 Pre-Budget Submission to the federal government specifically called for expansion of graduate education:

To meet the future demands of our economy, Canada needs to find ways to expand our graduate student capacity. Canada trails many other nations in the number of graduate degrees awarded, including the U.S. which awards almost twice as many master’s degrees and one-third more PhDs per capita than does Canada. ... Increasing the number of graduate students will be instrumental as Canada attempts to enhance private sector innovation through the digital economy strategy and the federal review of R&D.<sup>26</sup>

*The Commission on the Future of Graduate Education in the United States* starts its report with a statement that the competitiveness of the United States and its capacity for innovation “hinge fundamentally on a strong system of graduate education.” The Commission also notes that “... it is graduate education that provides students with advanced knowledge and skills that will secure our future intellectual leadership in the knowledge economy.”<sup>27</sup>

Existing research has found a strong relationship between graduate education and economic performance. The *Conference Board of Canada* found a positive relationship between higher PhD graduation rates and a country’s patenting activity, and business expenditures on research and development – characteristics that are commonly used to measure innovation in knowledge-based economy.<sup>28</sup> The evidence from other countries also support these conclusions: Irish scholars found that Research and Development (R&D) firms that employ PhDs produced a significantly higher number of patents than those that do not employ PhDs.

<sup>25</sup> The Natural Science and Engineering Research Council of Canada (NSERC), *Policy and Guidelines on the Assessment of Contributions to Research and Training*.

<sup>26</sup> Association of Universities and Colleges of Canada, *Canada’s Universities: Valued Partners in Canada’s Prosperity*, November 30, 2010.

<sup>27</sup> The Commission on the Future of Graduate Education in the United States, *The Path Forward: The Future of Graduate Education in the United States*, 2010.

<sup>28</sup> Conference Board of Canada, *How Canada Performs: Advanced Skills and Innovation*, June 2011.

Research in the United States demonstrates that companies that are spun out of research activities have a far greater success rates, thus creating good jobs and spurring economic activity.<sup>29</sup> Graduate students are first-hand participants in university research and are often partners in, or the driving force behind, companies that are created as a result of the research done.

Research from the *Institute for Competitiveness and Prosperity* demonstrates that increasing levels of educational attainment in Ontario to match those in the U.S. would increase Ontario's productivity by \$1,200 per capita.<sup>30</sup>

Graduate education in the field of business has also been found to be crucial in advancing economic prosperity. The Task Force on Competitiveness, Productivity and Economic Progress found that Ontario business managers tend to be less educated than their colleagues south of the border, which is likely limiting Ontario economic growth and development.<sup>31</sup>

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<sup>29</sup> The Social Coalition, *Sparking Economic Growth*, April 2010.

<sup>30</sup> Institute for Competitiveness and Prosperity, *Canada's Innovation Imperative*, Report on Canada 2011.

<sup>31</sup> Task Force on Competitiveness, *Productivity and Economic Progress; Prospects for Ontario's Prosperity*, November 2010.

**APPENDIX II - COMPARISON OF AVERAGE ANNUAL GROWTH RATES BETWEEN THE UNITED STATES AND ONTARIO**

With respect to growth across specific programs, particularly programs in high-demand and emerging fields, Ontario is growing its graduate Engineering and Applied Science programs faster than the United States. However, it is still lagging behind the United States in the growth rates of doctoral degrees in Health Sciences.

*Comparison of Average Annual Growth Rates between the United States and Ontario (2004-05 to 2009-10)*

	Ontario (%)	United States (%)
Master's Degrees Awarded		
<b>Total</b>	5.5	2.9
Engineering	3.1	1.6
Health Sciences	10.7	10.5
Doctoral Degrees Awarded		
<b>Total</b>	6.6	5.0
Engineering	13.0	3.4
Health Sciences	7.3	18.0

*Sources: Council of Graduate Schools (United States) and Council of Ontario Universities.*