THE DIVERSITY OF ONTARIO'S UNIVERSITIES:

A Data Set to Inform the Differentiation Discussion

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Executive Summary

The Ontario government has indicated its intention to negotiate individual mandate statements with each of Ontario's public postsecondary institutions and to amend funding formulas to focus resources on what each institution does best. These actions signal the government's desire to pursue a policy of greater institutional differentiation within the Ontario public postsecondary system. The purpose of this paper is to inform and assist the development of a differentiation framework for the university sector by describing the diversity of Ontario universities on variables that other jurisdictions have used to differentiate their university systems. These variables are important to consider first because they are globally accepted, and therefore influence the way the rest of the world will judge the Ontario system and its quality.

The paper describes the differences among Ontario's 20 universities on key variables related to their *comprehensiveness* and *research intensity*.

The data suggest that the University of Toronto is in a cluster of its own. Not only does it lead all Ontario universities on each of the variables considered, it does so by a substantial margin on some key ones, such as doctoral degrees granted, research income, publications and citations.

Six other universities cluster at the upper end of research intensity: Guelph, McMaster, Ottawa, Queen's, Waterloo and Western.

There is a cluster of mainly undergraduate universities that are less involved in graduate education, especially at the PhD level, and attract a lower level of research income. This cluster includes: Algoma, Brock, Laurier, Lakehead, Laurentian, Nipissing, Ontario College of Art and Design University (OCADU), Trent and University of Ontario Institute of Technology (UOIT). Two of these universities – UOIT and OCADU – have specialized mandates, and other jurisdictions sometimes include a category of "special purpose universities" in their differentiation frameworks for such cases.

Four Ontario universities – York, Carleton, Windsor and Ryerson – fall between the more research intensive and mainly undergraduate clusters.

The analysis provided here raises questions for government related to such things as the allocation of graduate spots and the assignment of rights and responsibilities, through mandate statements negotiated with the institutions, to universities in each of the different clusters. The analysis also underscores the importance of articulating other parameters that matter to the province and to the public that could act as other important dimensions for an Ontario differentiation framework.

Purpose of this paper

On May 30 2011, the then-Minister of Training, Colleges and Universities announced the government's intention to negotiate individual mandate statements with each of Ontario's public postsecondary institutions and to amend funding formulas to focus resources on what each institution did best (Milloy, 2011). These statements signalled the government's desire to pursue a policy of greater institutional differentiation within the Ontario public postsecondary system, a policy recommended by several analyses suggesting the benefits of such an approach (Clark et al., 2009, 2011; HEQCO, 2010, 2013).

In June 2012, the Ministry of Training, Colleges and Universities (MTCU) pursued this differentiation policy in a tangible way by asking each of the province's 44 public postsecondary institutions to generate a mandate statement that articulated the institution's values, aspirations and goals and to identify three key institutional objectives consistent with that mandate. These submissions were reviewed by an independent Expert Panel convened by the Higher Education Quality Council of Ontario (HEQCO).

The Expert Panel strongly endorsed the goal of a more differentiated Ontario postsecondary system and urged government to adopt a more active role in system planning, lest the quality of higher education in Ontario continue to erode. The Expert Panel did not recommend a specific differentiation framework for Ontario, although it referenced such schemes in other provinces and states and thereby identified variables that were important to the differentiation frameworks in those jurisdictions (HEQCO, 2013).

An earlier paper by HEQCO (2010) laid out the arguments for and benefits of a more differentiated Ontario postsecondary system and offered some high-level advice to government about how this might be achieved. The Expert Panel Report on the Strategic Mandate Agreements continued that work by making specific recommendations to government and providing a more detailed commentary on the state of the postsecondary system in Ontario (HEQCO, 2013). The current paper builds on these reports by examining the diversity of Ontario's universities and, based on the data, by suggesting a framework that could assist the development of a more differentiated postsecondary system.

Ultimately, as recommended by the Expert Panel, a key decision government will need to consider regarding differentiation is the utility of maintaining the strong college-university dichotomy that now exists in Ontario. As a first step, though, it is easiest to consider the issue of differentiation within each of the university and college sectors separately. The current paper focusses on universities; a corresponding analysis for the Ontario college sector is forthcoming.

Dimensions of differentiation

Although one could theoretically propose any dimension along which postsecondary institutions could be distinguished, two fundamental properties dominate current differentiation classification schemes. The first is the *comprehensiveness* of institutions. The second is *research activity*.

Comprehensiveness is indexed in a number of ways. One relates to the range of programs that a university offers. Some universities focus primarily or exclusively on undergraduate (baccalaureate) programs; others also offer a

varying number of graduate programs (master's and doctoral degrees). Some universities focus almost exclusively on arts and sciences; others house a varying range of professional schools (e.g., engineering, law, medicine). With professional schools, the presence of a medical school is especially salient because it constitutes a high percentage of the university's total faculty complement, accounts for a significant proportion of the university's research activity and absorbs a nontrivial proportion of the university's operating budget. (There is a reason that *Maclean's* reserves one category of its classification scheme for universities with medical schools.) Comprehensiveness often correlates with the size of universities, measured by student enrolment, faculty complement, operating budgets and campus size. In general, the more comprehensive the institution, the larger it is, although the correlation is not perfect.

Research activity is measured by a host of variables. The dominant measure is total research income (or total sponsored research revenue), which represents the sum of all external monies provided to the university by granting councils, industry or any other outside bodies to support its research work.[1] To account for differences in the size of institutions, total research income can also be expressed as research income per eligible faculty member. Since most graduate students are also engaged in active research (exceptions, for example, include course-based master's programs), the size of the graduate student cohort can also index an institution's research involvement and profile. One can consider the total number of graduate students or the percentage of graduate students relative to total student enrolment. Differentiation frameworks tend to emphasize doctoral (PhD) students. There are several reasons for this. First, the PhD is the quintessential and highest research credential offered by North American universities. Second, many institutions themselves tout PhD students as critical to their overall research effort and activity. Third, the total graduate cohort may include students in master's programs that are not research based or that are related to professional credentials (e.g., Master of Business Administration).[2] It is not coincidental that the number of PhD graduates per year is an important criterion for membership in the cohort of Canada's most research-intensive universities, the U-15.

Except as they may relate to reputational surveys and rankings, quantitative analyses of research quality and impact are rarely incorporated into differentiation frameworks. However, citation analyses or measures such as H-scores index the impact of research conducted by faculty members in a university.

There are two other dimensions of differentiation common in other jurisdictions, both of which are absent in the Ontario system. The first relates to the philosophy of the undergraduate curriculum. The best example is the distinction in the United States between the liberal arts undergraduate colleges (e.g., Swarthmore, Williams College, the Claremont colleges) and the research-intensive universities (University of California, Berkeley, University of Michigan, Stanford University). As the Expert Panel noted on its review of the Strategic Mandate Agreement submissions, essentially all of Ontario's universities characterize themselves as, and aspire to be, research intensive; no Ontario university presents itself as a primarily undergraduate liberal arts university. In contrast, four universities in Canada (Bishop's, St. Francis Xavier, Mount Allison and Acadia) have banded together

[1] We recognize that different disciplines are differentially dependent on external grants to support their research and scholarly activities. However, this variable is still considered to be one of the prime indices of the total research activity at a university, especially for inter-institution comparisons.

[2] For example, according to the Common University Data Ontario (CUDO), in 2011, 38% of the master's degrees conferred by Wilfrid Laurier University were in the business and commerce category. CUDO does not identify how many of these degrees are Master of Business Administration (MBA). This general problem is the inability to discriminate master's degrees that transition to the doctorate (and, therefore, are research-based) from professional and course-based master's programs in Ontario (that may or may not involve research). In contrast, all doctoral programs are research-based.

as a U-4 on the basis of their commitment to and focus on a liberal arts undergraduate education. There are other public (University of King's College in Nova Scotia) and private (Quest University in British Columbia) universities in Canada that promote themselves as liberal arts undergraduate colleges akin to their counterparts in the United States.

A second often-used dimension of differentiation absent in Ontario relates to the mode of instruction; specifically, postsecondary institutions that offer their programs online. In the United States, this would include institutions such as the University of Phoenix and Western Governors University. Athabasca University in Alberta is the prototypical example in Canada. Ontario has no online or open university, although there has been discussion along these lines for some years. Ontario universities vary considerably in terms of their use of online technology, but none advertise themselves, or appear inclined to promote themselves, to a degree of internet-based instruction that rivals its centrality to acknowledged online institutions.

Finally, it is worth noting here that the Expert Panel rejected the idea that regionalism by itself was a rational dimension of differentiation in the Ontario system.

In subsequent sections of this paper, we describe the variation among Ontario's 20 universities on variables considered to be the most important with respect to the differentiation of higher education institutions.[3] Before that, however, the next section discusses how these data can be used to develop a postsecondary differentiation framework.

Using data to develop an Ontario differentiation framework

Some have opined that there is no reason to pursue further differentiation discussions in Ontario because the province's universities are already different on the dimensions noted above. These critics miss the point. Of course Ontario universities differ in size, research profile and participation in graduate studies. The critical point, however, is that all Ontario universities, regardless of the details of their current state and makeup, appear to aspire to the same goal; specifically, to grow discovery research programs and expand graduate studies. As the Expert Panel noted after its review of the Strategic Mandate Agreements (SMAs) submitted by Ontario's universities, "…the SMA's demonstrate a tendency to greater homogenization of the system based on preferences within the academy for research and advanced degrees, rather than greater institutional differentiation" (HEQCO, 2013, p. 11).

[3] The Carnegie Classification of Institutions of Higher Education has been the leading framework for recognizing and describing institutional diversity in U.S. higher education for the past four decades. See http://classifications.carnegiefoundation.org/ for more details. The best Canadian examples of differentiation in higher education systems come from Alberta (see Alberta Ministry of Enterprise and Advanced Education (2007), *Roles and Mandates Policy Framework for Alberta's Publicly Funded Advanced Education System*, http://eae.alberta.ca/post-secondary/policy/roles.aspx) and British Columbia (Degree Authorization Act (2002), retrieved from BC Laws website: http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_02024_01; and Ministry of Advanced Education (2006), *Degree Program Review: Criteria and Guidelines*. Victoria, British Columbia: Minister of Advanced Education, http://www.aved.gov.bc.ca/degree-authorization/documents/degree-program-criteria.pdf

The Expert Panel noted further that "…differentiation is a tool… its benefits are to maximize the quality of the overall system by enabling each institution to make an optimal and distinctive contribution to the province's higher education system…" (HEQCO, 2013, p. 11). This is exactly what MTCU was striving for when the Minister announced the government's intention to focus resources on what institutions do best. The fact that Ontario universities differ is precisely what permits the development of a rational differentiation framework. When such a framework is implemented, the impact of public support of universities is optimized, universities use their own resources more purposefully and students are presented with clear choices about which institutions best serve their personal and professional goals.[4] This is how the quality of the overall system is uplifted and it is what the best differentiation frameworks enable.

The role of data is to provide the hard facts about the current activities of Ontario's universities to inform the development of a sensible differentiation framework.

A differentiation framework could treat every university independently. However, many differentiation frameworks cluster like-minded institutions into categories in which institutions share the same rights and responsibilities as others in their cluster. The data presented in this paper are a first step towards seeing whether such clusters already exist on those variables that appear most critical to the design of a differentiation framework. If so, the next step is to clarify the relationship between the institutions in that cluster and government policies. By definition, a differentiation framework suggests that different clusters will have a different set of roles, responsibilities and expectations associated with them to allow different types of institutions to optimize their contribution to the overall system.

A differentiation framework defines differences among institutions. It does not signal differing merit, value or worth. The development of a differentiation framework is an exercise in a better, more rational and more effective allocation of public resources and a strategy for optimizing institutions' use of their own resources. A differentiation framework offers students clarity of choice about which institutions in a system best serve their personal and professional goals.

Differentiation is compatible with a commitment to access. As the Expert Panel noted, "…Providing sufficient spaces for qualified students should remain a public policy imperative" (HEQCO, 2013, p. 9). A differentiation framework, however, would define where increased access is best positioned to occur and how we could best couple enrolment growth with quality considerations.

In the short term, the implementation of a differentiation framework in Ontario could constrain the desires or aspirations of some universities. This depends, of course, on the alignment between the university's goals and the roles, rights and responsibilities of institutions in their cluster. However, rather than concentrating on what a university should not do, a useful differentiation framework enables institutions to do even more of what they do best. And, there is nothing about the existence of a differentiation framework that constrains a university from being as innovative as it wishes as it pursues what is expected of it. As the Expert Panel suggested, it is the role of government (in consultation with the institutions) to establish the differentiation framework and associated

[4] A critical feature of a well-designed postsecondary system is an efficient, transparent and effective transfer credit system so students can move efficiently and smoothly, with appropriate credit for prior learning, from one institution to the next when their personal or career goals change.

policies and accountability mechanisms to monitor performance. It is not the role of government to define the means, strategies or paths by which institutions would pursue and achieve their goals.

The data: How different are Ontario universities on variables relevant to differentiation frameworks?

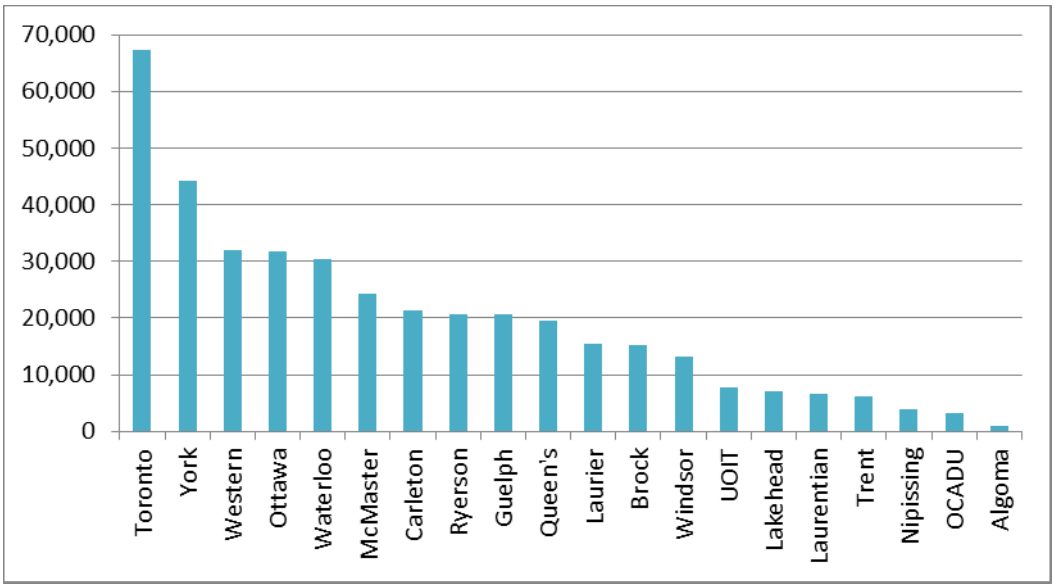
Table 1 provides data from each Ontario university on variables most relevant to the development of differentiation frameworks. Explanatory notes for all tables and figures are contained in Appendix 1.

Table 1: Overview of Ontario's universities

University	FT enrol-ment	FT Faculty	Operating Budget ($000)	# Degrees Awarded			Professional Schools			Sponsored Research Income		H-index
				Total	PhDs	% PhDs	Engineering (accredited)	Medicine	Law	Total ($000)	Per FT Faculty ($000)	
Algoma University	921	57	$20,538	202	0	0.0%				-	-	0.27
Brock University	15,321	582	$215,868	4,092	21	0.5%				$14,831	$27.6	0.71
Carleton University	21,438	851	$353,769	4,716	131	2.8%	✓			$59,343	$80.1	0.96
Lakehead University	6,999	319	$117,425	2,478	8	0.3%	✓	✓ (NOSM)	✓	$22,263	$72.8	0.61
Laurentian University	6,741	424	$134,103	2,229	9	0.4%	✓	✓ (NOSM)		$24,447	$59.9	0.58
McMaster University	24,328	936	$498,796	6,422	210	3.3%	✓	✓		$325,946	$248.6	1.10
Nipissing University	3,910	178	$66,802	1,738	0	0.0%				-	-	0.43
OCAD University	3,328	102	$58,998	684	0	0.0%				-	-	0.40
Queen's University	19,576	841	$415,239	5,530	172	3.1%	✓	✓	✓	$163,280	$200.1	1.15
Ryerson University	20,775	808	$425,882	6,082	23	0.4%	✓			$29,518	$40.0	0.68
Trent University	6,114	237	$104,181	1,788	12	0.7%				$14,263	$60.2	1.09
University of Guelph	20,730	763	$370,846	5,205	123	2.4%	✓			$153,068	$192.5	1.07
University of Ottawa	31,789	1273	$677,270	8,700	207	2.4%	✓	✓	✓	$276,220	$213.1	1.11
University of Toronto	67,271	2449	$1,618,370	16,384	830	5.1%	✓	✓	✓	$915,661	$377.3	1.39
University of Waterloo	30,501	1093	$568,645	6,538	263	4.0%	✓			$146,779	$144.8	1.19
University of Windsor	13,181	504	$229,438	4,019	67	1.7%	✓		✓	$32,129	$62.6	0.86
UOIT	7,752	209	$131,427	1,345	2	0.1%	✓			$10,037	$63.1	1.01
Western University	32,078	1451	$657,223	8,720	289	3.3%	✓	✓	✓	$218,729	$153.8	1.09
Wilfrid Laurier University	15,382	534	$227,771	3,566	24	0.7%				$12,613	$25.3	0.88
York University	44,325	1475	$718,567	11,742	202	1.7%	✓		✓	$65,427	$47.7	1.17
Source	CUDO	CUDO	COFO	CUDO						Re$earch Infosource		HESA
Year of data	2011	2011	2011/12	2011			2013	2013	2013	2011		2012

The variables related to comprehensiveness – full-time (FT) head count enrolment, full-time faculty and operating budget – are highly correlated.[5] The value of this observation is that differentiation on the basis of size could use any one of these variables. Figure 1 shows the ordering of universities on the basis of enrolment.

Figure 1. Full-time head count enrolment of Ontario universities, including international students



With respect to professional schools, Table 1 shows that of the 20 Ontario universities, 14 have an accredited engineering program, six have medical schools (Lakehead and Laurentian share a relationship with the Northern Ontario School of Medicine) and seven have law schools.

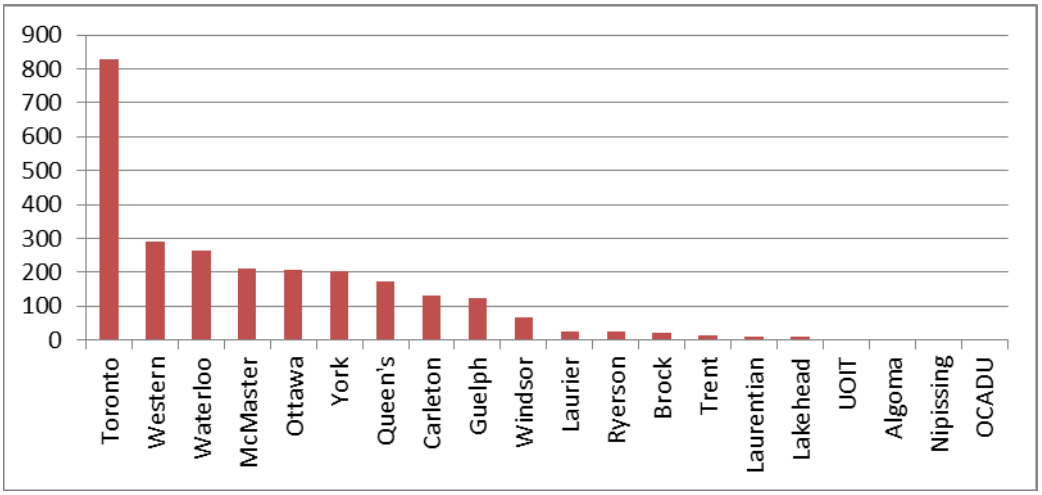
The relationship between the number of master's and doctoral degrees granted by each university per year is also very strong, with a correlation coefficient of 0.96.[6] This suggests that once a university enters the realm of graduate studies it does so at both the master's and doctoral levels. There is not a strong tendency in Ontario, therefore, for universities to specialize at the graduate level, for example by specializing on master's-level programming and eschewing PhD programs.

Figure 2 shows the distribution of Ontario universities on the number of PhDs granted.

[5] The correlation between enrolment and faculty is 0.99; between enrolment and operating budget is 0.98; and between FT faculty and operating budget is 0.98.

[6] We prefer to look at graduates rather than enrolments because it is typically advisable to consider outcome measures – in this case, successful completion of a program – rather than inputs.

Figure 2. Number of PhD degrees granted in 2011



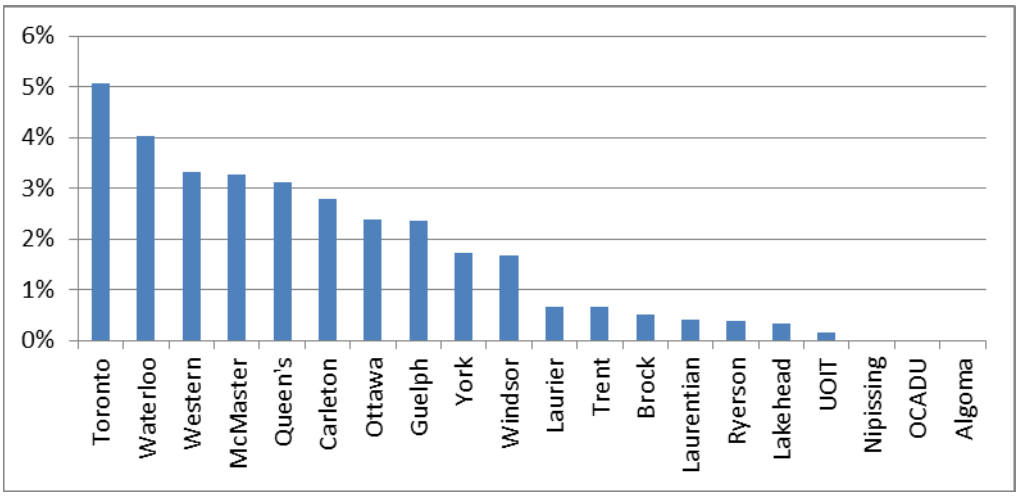
By a substantial margin, the University of Toronto leads all Ontario universities in PhD graduates. In fact, the University of Toronto leads all Canadian universities on this measure.

It is worth noting that many more Ontario universities now grant the PhD than was the case a decade ago. In 2011, 17 of 20 Ontario universities granted at least one PhD degree; only Algoma, Nipissing and OCADU were out of the PhD-granting market. In contrast, in 2000, only 11 of Ontario's 19[7] universities granted PhDs; new entrants into the PhD-granting business since 2000 include Brock, Lakehead, Laurentian, Ryerson, Trent and UOIT.

Figure 3 shows the number of doctoral (PhD) graduates as a percentage to the total number of university graduates at each Ontario university in 2011.

[7] UOIT was established in 2002. Algoma was an affiliate of Laurentian in 2000 and became independent in 2008.

Figure 3. The percentage of graduates of each university in 2011 who graduated with a PhD



With respect to research income, the relationship between the total research income and research income per full-time faculty member in the Ontario system is also very high, with a correlation coefficient of 0.92. This suggests that either variable could be used as the basis for a differentiation framework based on overall research activity.

Figure 4 shows the total research income of each Ontario university in 2010-11. The University of Toronto leads all Ontario universities by a substantial margin. The significant research intensity of the University of Toronto compared to all other Ontario universities is reinforced by Figure 5, which shows the contribution of each Ontario university to the total number of publications emanating from the Ontario university system.

Figure 4. Sponsored research income of each Ontario university in 2010-11

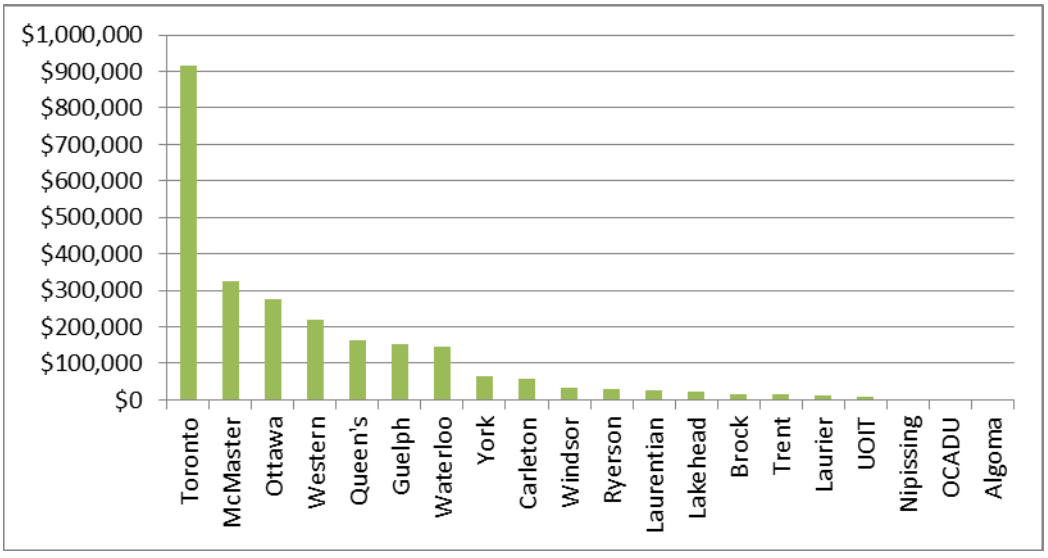
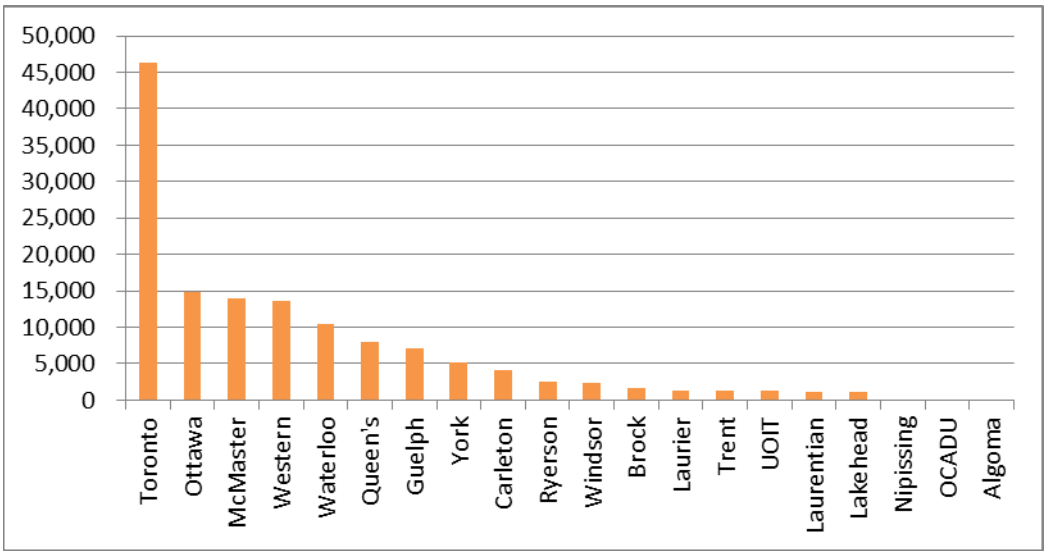


Figure 5. The contribution of each Ontario university to the total number of publications in the Ontario university system between 2008-2012



Total research income is a measure of the total research effort of the institution. It is also possible to measure the impact of a university's research effort. Figures 6 and 7 provide measures of the impact of the research emanating from each Ontario university. Figure 6 shows that publications from the University of Toronto are more frequently cited by a substantial margin by the rest of the world than those from any other Ontario university.

Figure 6. The contribution of each Ontario university to the total number of citations of papers published by the Ontario university system between 2008-2012

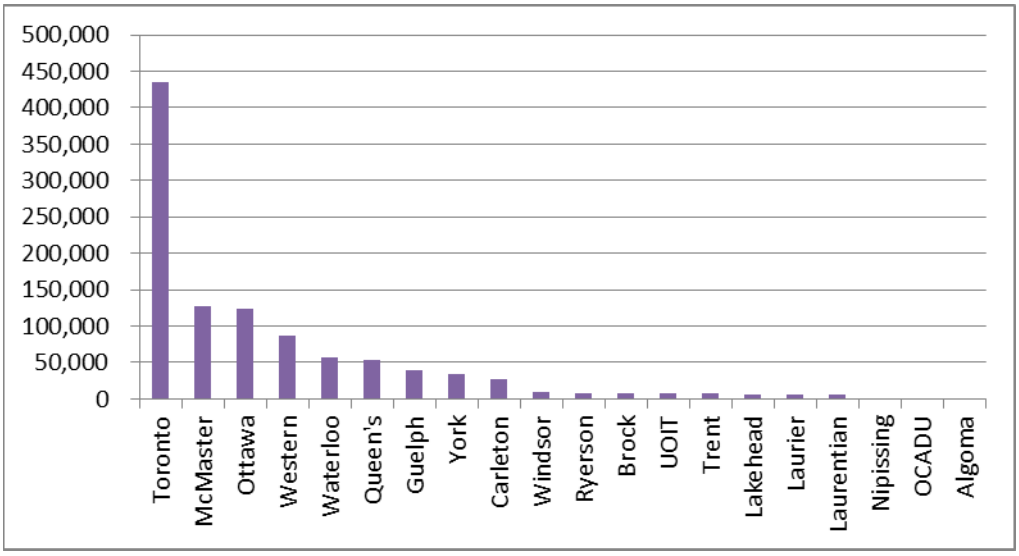
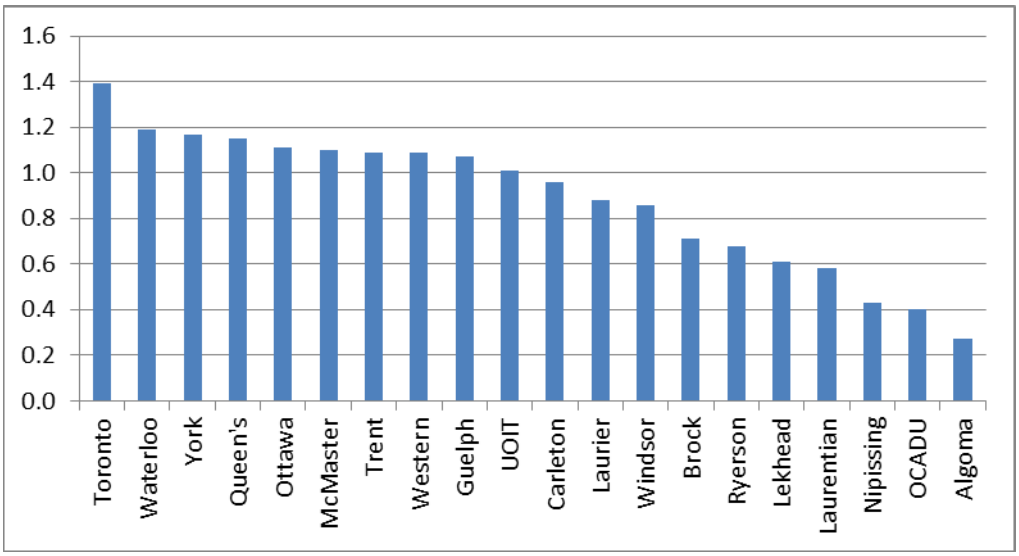


Figure 7 shows the average H-indices of faculty in each institution, averaged across the university and standardized for each faculty member for their discipline of study. H-indices capture both the number of research publications by a faculty member but also how often these publications are cited. For a fuller description of the H-index and how it is calculated, see Appendix 4 of HEQCO's productivity report (HEQCO, 2012).

Figure 7. Mean standardized H-scores in each institution



Conclusions

The purpose of this paper was to examine the diversity of Ontario's universities on variables that other jurisdictions have used to differentiate the universities within their systems.

The data suggest the existence of several clusters that can inform the development of a differentiation framework in Ontario.

1. **The University of Toronto is in a cluster of its own.**

The data suggest that the University of Toronto is in a cluster of its own. It is not simply that it leads all Ontario universities on all of the variables presented. It is especially the degree to which its results exceed those of all other Ontario universities, particularly on the two variables that may matter the most – PhDs graduated and research income. The University of Toronto graduates about 2.5 times as many PhDs as the second-ranked Ontario university. Its research income is almost 3 times greater than that of its nearest Ontario competitor. The University of Toronto leads all Canadian universities on both of these indicators. It is Ontario's, indeed Canada's, most highly placed university in many global rankings.

Given this observation, one might also consider the capacity of the University of Toronto to compete with its international competitors, the world's most highly ranked universities.

Table 2 shows graduate enrolment as a percentage of total enrolment for the 30 most highly ranked universities in the 2012 Times Higher Education Rankings of World Universities. Two conclusions are obvious when comparing the University of Toronto to its peer group of world-ranked universities. First, the University of Toronto is significantly bigger than any of its competitors. Second, the cohort of graduate students at the University of Toronto is among the smallest of any of its competitors.

Table 2. Top 30 universities in the Times Higher Education World University Rankings in 2012, showing university type and total student enrolment and graduate enrolment as a percentage of total enrolment

Rank	University	Enrolment	% Graduate	Type
1	California Institute of Technology	2,231	56.2%	Private
2	University of Oxford	25,595	34.9%	Public
2	Stanford University	19,945	65.0%	Private
4	Harvard University	27,392	62.4%	Private
5	Massachusetts Institute of Technology	10,894	59.8%	Private
6	Princeton University	7,813	33.4%	Private
7	University of Cambridge	19,945	38.7%	Public
8	Imperial College London	15,641	41.5%	Public
9	University of California, Berkeley	36,137	28.4%	Public
10	University of Chicago	14,979	63.9%	Private
11	Yale University	11,875	55.0%	Private
12	ETH Zürich – Swiss Federal Institute of Technology Zürich	16,701	49.5%	Public
13	University of California, Los Angeles	39,271	30.7%	Public
14	Columbia University	26,050	68.8%	Private
15	University of Pennsylvania	24,832	52.6%	Private
16	Johns Hopkins University	20,996	72.2%	Private
17	University College London	24859	44.6%	Public
18	Cornell University	21,131	33.0%	Private
19	Northwestern University	20,959	54.8%	Private
20	University of Michigan	42,716	35.8%	Public
21	**University of Toronto**	**73,817**	**20.0%**	**Public**
22	Carnegie Mellon University	11,531	48.4%	Private
23	Duke University	15,427	56.7%	Private
24	University of Washington	42,444	31.6%	Public
25	University of Texas at Austin	51,112	24.8%	Public
25	Georgia Institute of Technology	20,941	33.4%	Public
27	University of Tokyo	28,793	50.9%	Public
28	University of Melbourne	43,240	N/A	Public
29	National University of Singapore	33,067	19.1%	Public
30	University of British Columbia	57,200	18.4%	Public

In terms of the undergraduate experience it can offer, Table 3 shows the percentage of small undergraduate classes at the University of Toronto compared to other universities ranked in the Top 30. A substantially smaller percentage of University of Toronto undergraduates enjoy the opportunity for small classes compared to its international competitors.

Table 3. Percentage of classes offered that are small

University	% classes <20 for U.S. universities, <30 for University of Toronto
Columbia University	81%
Harvard University	78%
Yale University	77%
Northwestern University	75%
University of Chicago	75%
University of Toronto	43%

Table 4 shows the revenue per student in 2010-11 for universities ranked in the Top 30 of the Times Higher Education World University Rankings in 2012, organized by type of institution. The University of Toronto operates with significantly less revenue per student than its international competitors.

Table 4. 2010-11 revenue per student of 20 universities ranked in the Top 30 of the Times Higher Education World University Rankings in 2012

Type	Revenue per student, 2010-11 (USD)
Private	$500,571
Private	$499,642
Private	$409,043
Private	$404,797
Private	$350,750
Private	$329,709
Private	$288,527
Private	$284,420
Private	$238,492
Private	$165,561
Private	$152,053
Private	$114,985
Private	$113,637
Public	$109,009
Public	$95,239
Public	$82,617
Public	$73,107
Public	$68,072
Public	$59,600
UofT	**$37,086**

2. **There is a cluster of more research-intensive universities in the Ontario system.**

Aside from the University of Toronto, the data identify a number of other universities that are at the upper end of research activity in the Ontario system. It is not surprising, perhaps, that this cluster includes the other five Ontario universities in the U-15 – McMaster, Western, Ottawa, Waterloo and Queen's. The University of Guelph shows a level of research activity that would place it in this cluster as well. These universities are likely subject to the same institutional disadvantages relative to their international competitors as were outlined above for the University of Toronto.

3. **There is a cluster of mainly undergraduate universities in the Ontario system.**

The data reveal a cluster of Ontario institutions that are not very involved in graduate education, especially at the PhD level, and that attract a lower level of research income. These institutions are mainly undergraduate universities and include: Algoma, OCADU, Nipissing, UOIT, Laurier, Trent, Brock, Lakehead and Laurentian. Two of these institutions – UOIT and OCADU – may be considered to have specialized mandates, and differentiation frameworks used in other jurisdictions sometimes establish a category of "special purpose universities" in such cases.

For completeness, there are four universities – York, Carleton, Windsor and Ryerson – that fall between the more research intensive and mainly undergraduate clusters.

Where do we go from here?

The conclusion we provide about clusters of Ontario universities might seem to some to be a blinding flash of the obvious. Some knowledgeable individuals we spoke to as we were pursuing this analysis spontaneously and successfully predicted the clustering that they believed the analysis would reveal.

Even with the limited number of variables considered in this analysis, the clustering we identify raises a number of questions for government.

The first is how to consider the four universities that do not fall easily into the two broad clusters of "more research intensive" and "mainly undergraduate." Is the pursuit of differentiation best served by creating a separate category for them or by allocating them to one of the two major clusters identified?

Second, the current financial and policy environment for higher education in Ontario coupled with the clustering proposed here raises some immediate questions for government. For example, should PhD spots be preferentially allocated to the more research-intensive universities and, if so, to what degree? Should government attempt to minimize the number of PhD programs in mainly undergraduate universities? How should the funding of master's programs, especially professional and course-based master's programs, be allocated across the clusters?

Third, what rights, expectations and responsibilities should be granted to institutions in the different clusters? And, as noted by the Expert Panel, these decisions are meaningful, worthwhile and effective only if they are tied to funding formulas, which represent the most powerful levers available to government to effect change. These debates are typically controversial, particularly as individual institutions consider how these decisions intersect

with their plans and aspirations. But, these are precisely the kind of discussions and decisions that are critical if the benefits of a more differentiated Ontario university system are to be derived and enjoyed by students, the public and the province.

A differentiation policy allows institutions to be the best at things that matter to the province, public and students. If it matters to Ontario to have a university that competes with the very best universities in the world, with all the benefits that accrue to the province as a result of having such a flagship, then this analysis suggests the one institution in the system best positioned to do just that.

If it matters to Ontario to have universities that offer an outstanding, high-quality liberal arts undergraduate experience that competes with the U-4 and other great liberal arts colleges, with all the benefits that accrue to the province as a result of having such institutions, then this analysis suggests a cluster of universities best positioned to do just that.

If it matters to Ontario to have universities that maintain a comprehensive set of high-quality research and graduate programs that are globally competitive, with all the benefits that accrue to the province as a result of having such institutions, then this analysis suggests a cluster of universities best positioned to do just that.

The first step for government, therefore, is to decide what matters to it and to the province. Although this is a discussion that merits broad and genuine consultation, it is one in which the provincial government, as the Expert Panel suggested, must be active, if not the leader.

The analysis provided in this paper differentiates Ontario universities on variables that matter to other jurisdictions. These variables cannot be ignored because they are broadly accepted and, therefore, the dimensions along which the rest of the world will judge the quality of the Ontario postsecondary system.

There is nothing to prevent Ontario, however, from deciding that there are other things that matter to it. For example, the province looks to universities as a source of commercialization and company creation. A recent international ranking of university-associated business incubators identifies Ryerson University's Digital Media Zone as a top global performer.[8] Similarly, Ontario could decide to differentiate universities on the basis of the degree of curriculum innovation. The critical considerations for any parameters along which a system could be differentiated is that they be variables that matter, that the mandate and expectations of institutions differentiated on the basis of those variables be clear, that the institutions be funded in accountable and meaningful ways aligned with those variables and, importantly, that the quality bar be set high, i.e., that the institutions differentiated on the basis of those variables strive to be among the best institutions of their kind in the world.

Given the conservative nature of higher education it may take some time for an innovative institution to be acknowledged and accepted. But the concept of institutional innovations, met initially with controversy but ultimately acknowledged as world-leading, should not be foreign to Ontario. The pioneering problem-based learning curriculum of McMaster's Faculty of Health Sciences and the fundamental principle of cooperative education at the University of Waterloo are excellent examples of programs and institutions that differentiated on the basis of considerations people believed really mattered and, although met initially with skepticism (if not active resistance), were ultimately understood to be best practice.

[8] http://ubiindex.com/benchmark-services/global-top-list-2013/

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Appendix 1. Explanatory notes for figures and tables

Table 1. Re: Overview of Ontario's universities

- University totals include affiliates, except for Hearst, which is not included with Laurentian, and St. Paul, which is not included with Ottawa.
- Full-time enrolment includes international students, fall 2011. Algoma enrolment sourced from its Multi-Year Accountability Agreement, 2011-12.
- Full-time faculty of Algoma sourced from Algoma web site, no year referenced; UOIT is for fall 2009; Western's Brescia is for fall 2010.
- Operating budget is COFO's "Operating-General Expendable Funds" total amount and is driven primarily by MTCU grants and tuition fees.
- Total degrees awarded includes bachelor's, first professional, master's and doctoral degrees. The total excludes undergraduate and graduate certificates and diplomas.
- Degrees awarded for Algoma are for 2010 and are sourced from MTCU.
- Sponsored research income is sourced from Re$earch Infosource and includes all funds to support research received in the form of a grant, contribution or contract from all sources (internal and external) to the institution.
- Sponsored research income per full-time faculty is based on faculty counts from 2010.
- Sponsored research data not included for Algoma, Nipissing and OCADU, as these institutions fall below the Top 50 threshold.
- H-index data was last updated in December 2012 and includes the mean standardized H-score.

Figures 1, 2, 3, 4 and 7. Re: Full-time enrolment in 2011

- These figures are graphic representations of the data in Table 1.
- The research incomes of Nipissing, OCADU and Algoma were below the value to be included in Re$earch Infosource's 2012 list of the Top 50 research universities in Canada.
- An H-index of 1.0 indicates the average on this measure.

Figures 5 and 6:

- Sourced from Incites™, total research publications from 2008 to 2012.
- Publications and citations data not included for Algoma, Nipissing and OCADU, as these institutions fall below the threshold employed by Incites™.
- The number of publications from Nipissing, OCADU and Algoma were below the threshold to be included by Incites™.

Table 2. Re: Top 30 universities in the Times Higher Education Rankings of World Universities in 2012

- For the universities in the United States, enrolment includes full-time and part-time head count as of the fall of 2011.
- University of Oxford and University of Cambridge enrolments include full-time equivalent students in 2011-2012.
- Imperial College London enrolment includes full-time and part-time head count for 2011-2012.
- ETH Zürich enrolment includes full-time and part-time head count for 2011.

- University of Toronto enrolment includes full-time and part-time head count as of the fall of 2011.
- University of Tokyo enrolment is as of May 1, 2011.
- National University of Singapore enrolment is as of September 2011 and includes full-time and part-time students.
- University of British Columbia enrolment is preliminary and includes full-time and part-time head count for 2012.
- Graduate enrolment for the University of Melbourne is not available for 2011.
- Sources for enrolment information: National Center for Education Statistics for universities in the United States, Higher Education Statistics Agency for University of Oxford and University of Cambridge, Common University Data Ontario for the University of Toronto, Association of Universities and Colleges of Canada for University of British Columbia, and institutional websites for all other enrolment statistics.

Table 3. Re: Percentage of classes offered that are small

- Data available are for classes with less than 20 students for the universities in the United States and less than 30 students for the University of Toronto.
- Sources: US News & World Report Ranking of Universities and the Common University Data Ontario.

Table 4. Re: 2010-11 revenue per student of 20 universities ranked in the Top 30 of the Times Higher Education World University Rankings in 2012

- Data from only 20 comprehensive universities of the Top 30 are available.
- Revenue includes endowment income but excludes auxiliary, hospital or independent operations.
- Sources: Integrated Postsecondary Education Data Systems (IPEDS), Canadian Association of University Business Officers (CAUBO) and Postsecondary Student Information System (PSIS).