Teaching Loads and Research Outputs of Ontario University Faculty Members: Implications for Productivity and Differentiation

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The more we understand about how faculty members discharge the obligations expected of them, the more we can do to create conditions and practices that permit faculty members to do their best work and for institutions and systems to operate at the most effective levels.

The government of Ontario has signalled the need for Ontario's publicly funded universities to seek additional productivity gains while sustaining access and quality in light of fiscal constraints.

Most germane to the productivity discussion are the relative teaching loads of faculty members who are activity engaged in research versus those who are not. In theory, given the typical distribution of effort, faculty members who are not active in research might be expected to teach double the load of research-active faculty.

The average course load during the 2012 academic year was 2.8 courses.

If research non-active faculty members were to teach twice the teaching load of their research-active colleagues, the overall teaching capacity of the full-time professoriate in Ontario would be increased by about 10%, a teaching impact equivalent to adding about 1,500 additional faculty members across the province.

Executive Summary

The government of Ontario has signalled the need for Ontario's publicly funded universities to seek additional productivity gains while sustaining access and quality in light of fiscal constraints. It has identified differentiation as a key policy driver to achieve these goals.

Implementation of these provincial directions likely involves consideration of how universities deploy their faculty to meet their differentiated teaching and research mandates. In fact, a preliminary examination by HEQCO of productivity in the Ontario public postsecondary system suggested that how universities deploy their faculty resources may be one of the most promising opportunities for universities to increase their productivity (HEQCO, 2012).

Little is now known about how faculty members actually allocate their efforts across their two major requirements – teaching and research – and how these distributions may differ in institutions with different characters. To gain insight into these issues, this study assembles publicly available data to obtain a sample of teaching workloads, research volume and impact, and remuneration for assistant, associate and full professors in the economics, chemistry and philosophy departments at 10 Ontario universities.

Based on these data, we find that the average course[1] load during the 2012 academic year was 2.8 courses. The average teaching load varied across disciplines – 3.0 for economics, 2.4 for chemistry and 2.9 for philosophy.

We further observe differences in average course loads across the universities in our sample. For economics and chemistry we find that primarily undergraduate universities have higher average course loads than research-intensive universities. As expected, research-intensive universities receive more external research funding and have a greater research impact as measured by citations.

From our data, we estimate that about 27% of faculty members in economics and 7% of faculty members in chemistry have neither published in peer-reviewed journals nor received a Tri-Council grant in a three-year period.[2] These research non-active faculty members teach, on average, 0.9 courses more in economics and 0.5 courses more in chemistry than their research-active colleagues.

Extrapolating from our sample, we suggest that if research non-active faculty members were to teach twice the teaching load of their research-active colleagues (as might be suggested by the typical 40%-40%-20% expectation of effort across teaching, research and service), the overall teaching capacity of the full-time professoriate in Ontario would be increased by about 10%, a teaching impact equivalent to adding about 1,500 additional faculty members across the province.

[1] Throughout this paper a course is defined as a semester-long for-credit course at the undergraduate or graduate level.
[2] Philosophy is not included in this part of the analysis.

Introduction

In response to a request from the provincial government, and consistent with the legislated mandate of the Higher Education Quality Council of Ontario (HEQCO), we published a preliminary analysis of the productivity of the Ontario public postsecondary system in December 2012 (HEQCO, 2012). In that report, we suggested two approaches to explore opportunities for increased productivity within the system. The first is at the government level (with the engagement of institutions) and is to consider a redesign of the postsecondary system and how it is funded. The second is at the institutional level and is to consider how workloads are distributed across the complement of faculty members. The latter suggestion was motivated by a pilot study, published in HEQCO's Productivity Report, from four Ontario universities which found little difference in teaching load between research-active and research non-active faculty members.

The current report extends this second suggestion by examining the teaching and research contributions of Ontario tenure and tenure-track faculty members[3] across three departments in 10 Ontario universities.

The 10 universities selected for examination cover the range of types of universities in the province; specifically, those that are more heavily research-intensive, those that are less research-intensive and more undergraduate-focused, and those that fall between the two ends of this distribution.[4]

The three fields of study examined are economics, chemistry and philosophy, disciplines that are typically located within the domains of the social sciences, sciences and humanities, respectively.

We recognize that teaching and research constitute only two components of a typical full-time faculty member's workload; the other is service. The service component includes both internal components (administrative and committee work) and external components (service on professional bodies, editorial boards, community involvement, etc.). Thus, we recognize that an analysis of teaching and research efforts does not capture the totality of a faculty member's workload. However, it captures the great majority of faculty efforts and the most important elements of what faculty members are expected to do.

[3] Specifically, we will examine the workloads of assistant professors, associate professors and full professors at the 10 selected universities. Assistant professors have typically earned their doctoral or professional degree and are beginning their full-time academic career. Associate professors typically have more experience and will have already built a scholarly reputation. Full professors will have demonstrated a more distinguished record of accomplishment. The granting of tenure is a separate but parallel process to the promotional journey. The details of each university's promotion and tenure review processes are set out in faculty collective agreements.

[4] The universities included in our analysis are: Brock, Carleton, Lakehead, McMaster, Ottawa, Queen's, Toronto, Western, Wilfrid Laurier and Windsor. In a recent HEQCO report (Weingarten, Hicks, Jonker & Liu, 2013) that describes aspects of differentiation among the province's universities, we observed that universities naturally sorted themselves into four clusters on the basis of data on overall institutional comprehensiveness and research intensity. In this study, we include universities from each of these four clusters: the University of Toronto in a cluster of its own, a cluster of more research-intensive universities (of which we include McMaster, Ottawa, Queen's and Western), a cluster of mainly undergraduate universities (we include Brock, Lakehead and Wilfrid Laurier), and a cluster of universities that fall between the research-intensive and mainly undergraduate clusters (we include Carleton and Windsor). Further details are provided in later sections of the paper.

The data examined here are publicly available from institutional websites and other public sources. We recognize the limitations of these data sets and acknowledge these constraints where relevant throughout the paper. However, the reality is that there are few institutional data available that document teaching and research outputs of faculty, particularly teaching, and for the moment the data posted publicly are the best we can obtain to advance these analyses. We understand that the Ontario university system has initiated an exercise to collect a more comprehensive data set. The actual nature and mode of data collection for this study are reported more fully in the Description of the Data section.

The Importance of Understanding Faculty Workload

A better understanding of faculty workload is important for several reasons.

First, at the most basic level, the quality, contributions and accomplishments of the faculty cohort are the most significant factors taken to reflect the quality, contributions and accomplishments of the university. As some say, "the faculty are the university."[5] Anything that might be learned to increase the capacity of the system as a whole or of individual institutions to enhance the output, contributions and accomplishments of faculty members can only be good.

Second, faculty compensation represents a significant percentage of institutional operating budgets. In 2011-2012, academic salaries for full-time and part-time academic-rank employees represented 29% of operating expenditures in the university sector in Ontario, a proportion that has remained steady over the past decade.[6]

Third, how faculty members distribute their time within the academy provides insight into the ways in which universities are differentiated. Our recent report on university differentiation reveals that Ontario universities differ considerably in terms of their degree of involvement and output in research (Weingarten et al., 2013). If this is the case, one might expect to see differences in terms of how faculty members at these diverse universities allocate their time across the different expectations typically placed on them.

In most Ontario universities, the typical expectation of full-time faculty members is 40% time/effort allocation to teaching, 40% to research and 20% to service, professional and administrative duties. Faculty collective agreements for two of the universities in our study explicitly set out the expected distribution of faculty workload between teaching, research and service: Brock ("normally 40% teaching, 40% research and 20% service") and Carleton ("the normal workload of faculty employees shall include teaching, research... and service... in proportions of approximately 50%, 35% and 15% respectively"). Seven others refer to the three areas of responsibility without establishing precise proportions. Half of the collective agreements for the universities in our study establish departmental guidelines, mechanisms and even appeal processes to negotiate the actual annual workloads for individual faculty members, and several explicitly speak to the adjustment of teaching load expectations for individual faculty members depending on their research and/or service responsibilities.

[5] During a speech to honor Isidor Rabi for his Nobel Prize for Physics, then-president of Columbia University Dwight Eisenhower referred to faculty members as employees. Rabi interrupted him and said, "Excuse me, sir, but the faculty are not employees of the university. The faculty are the university" (http://academicanchor.wordpress.com/2012/08/09/dwight-eisenhower-and-university-faculty/).

[6] In 2000-2001, academic salaries (excluding benefits) accounted for 31% of operating expenditures. 2000-2001 and 2011-2012 data are from the Financial Report of Ontario Universities of the Council of Ontario Finance Officers (COFO). The universities' "Operating Fund" accounts for the costs of instruction and research (other than sponsored or contract research), academic support services, library, student services, administrative services, plant maintenance and other operating expenses of the university financed by fees, operating grants and other general unrestricted revenue. Operating fund expenditures in 2011-2012 accounted for 60% of overall sector expenditures. Within the operating fund, salaries and benefits account for 77% of total operating expenditures, with academic salaries and benefits accounting for about half of this amount.

Fourth, and finally, part of the growing interest in how faculty members allocate their time reflects a general public concern about the productivity of universities, including faculty compensation and teaching loads. There are also growing concerns about the financial sustainability of Ontario's public higher education system. It is best if this discussion is informed by evidence and data. Given the centrality of faculty to the work and accomplishments of a university, it seems only sensible to provide whatever information can be accumulated about their efforts and accomplishments.

What Do We Know?

A number of studies using survey and administrative data have sought to analyse the time/effort allocation of faculty members to teaching, research and service.

On an international level, Bentley and Kyvik examine differences in how faculty members spend their time at research universities across 13 countries (Argentina, Australia, Brazil, Canada, China, Finland, Germany, Italy, Malaysia, Norway, the UK, the USA and Hong Kong) and find that faculty members spend more time on teaching than research (Bentley & Kyvik, 2012) and that the amount of time spent on research declines with age (Bentley & Kyvik, 2013).

In the United States, the National Center for Education Statistics conducted a National Study of Postsecondary Faculty in 1988, 1993, 1999 and 2004 to better understand who faculty members are and what they do. The faculty survey included information on demographic characteristics, employment status, academic rank, courses taught, publications and other additional measures relating to job satisfaction and compensation. The consulting firm MGT of America Inc. used the National Study of Postsecondary Faculty to show that while faculty members at comprehensive and two-year institutions spend a higher percentage of their time on teaching than those at research and doctoral institutions, faculty members at all institutions, regardless of type, spend more time on teaching than research in the United States (MGT of America, 2002).

Using data about science and engineering faculty at 150 Carnegie-extensive doctoral/research universities in the US, Link, Swann and Bozeman (2008) examined the relationship between tenure (and promotion) and time allocation, and identified specific trade-offs related to particular career paths. For example, the authors found that long-term associate professors who had not been promoted to full professor spent more time teaching and less on research, and that full professors spent increased time on service responsibilities at the expense of teaching and research.

In 2011, the University of Texas system, responding to a public information request, published a spreadsheet of individual faculty data that included information on earnings, course loads and research grants for 2009-2010.[7] Vedder, Matgouranis and Robe (2011) from the Center for College Affordability and Productivity unleashed a spirited debate on workload in the US after analysing the data to suggest that a minority of faculty at the University of Texas at Austin do the majority of teaching and that significant productivity gains would be achieved if this disparity were addressed by the institution. An even more controversial report was released by O'Donnell (2011), who used the Texas data to classify faculty members as "Dodgers and Coasters" (low teaching and research productivity), "Sherpas" (teaching productive), "Pioneers" (research productive), or "Stars" (teaching and research productive)[8] on the basis of course loads and the value of externally funded research. The University of Texas at

[7] The data were released a second time with some data corrections and more comments about the data.

[8] Dodgers (non-tenured faculty) and Coasters (tenured faculty with seniority) are the least productive faculty members according to O'Donnell's analysis, and bring in no externally funded research and teach few students. While Sherpas also bring in no external research funding, they have heavier course loads. Pioneers and Stars bring in a high level of external research, but Pioneers have lighter course loads while Stars have higher course loads.

Austin then published its own study on faculty productivity, concluding that its system was indeed productive; that UT Austin professors, as a group, produce over one and a half times the amount of formula and research funding than they receive in compensation; but that the data also reveal opportunities to increase teaching productivity (Musick, 2011).

The National Study of Instructional Costs and Productivity, also known as the Delaware Study, maintains a tool for assessing the costs associated with faculty workload that it makes available to other institutions (University of Delaware Office of Institutional Research, 2013). Since 1992, nearly 600 institutions and a number of consortia and state agencies have participated in the Delaware study, including Ontario's Guelph and Wilfrid Laurier universities. The Delaware study allows institutions to benchmark their costs, including those relating to faculty deployment, against comparable institutions at the departmental level. The study reports exclusively to its client universities and releases very little information to the public.

In Canada, Crespo and Bertrand (2013) use survey data at a research university in Canada and find that faculty spend more time on teaching than research. The authors find that faculty allocate 44% of their time to teaching, 35% to research, 15% to service and 6% to administrative tasks.

HEQCO's Productivity Report, which was released in 2012, included pilot data from four participating Ontario universities on teaching workloads for full-time faculty members. The data reveal that the average course load was 3.4 (semester-long) courses per year per faculty member. The report also revealed a difference in average course loads for research-active (3.0 courses) and research non-active faculty members (3.8 courses).

In their Canadian book *Academic Transformation*, Clark, Moran, Skolnik and Trick (2009) suggest that teaching loads have been decreasing over time. They use university records to examine academic program submissions for 30 departments and programs across 10 universities in Ontario and find that the most common reported teaching load is four one-term courses per faculty member per year. The authors also find evidence that many faculty members have teaching loads reduced due to research, graduate supervision or administrative responsibilities.

In a discussion paper published by the Council of Ontario Universities, Saunders (2011) notes that "teaching loads vary among universities and departments (and even within departments) with loads of three courses taught per semester over two semesters (termed 3-3) at the high end, and 3-2 or 2-2 more typically. Notably in the sciences, the load is often considerably less. The decrease in teaching load in the last few years is meant to allow more time for research and to increase research productivity, increasing the primary international measure of institutional excellence."

Looking to the collective agreements and related public documents from the universities in our study for guidance on teaching workloads, we find that five include specific teaching workload expectations: Brock (maximum four semester-length courses); Lakehead (not to exceed five); Laurier (four); Queen's (norms established by department; philosophy and economics set to four courses); and Western

(workloads identified by departments, chemistry set to 4.2 courses, less where there are lab components).[9]

Common criticisms of studies that examine how faculty members spend their time include: that such studies do not measure actual outputs (Link, Swann & Bozeman, 2008), that many do not differentiate by discipline (Bland, Center, Finstad, Risbey & Staples, 2006; Dennison, 2011), and that workloads and productivity should be examined separately for instructors and professors (Musick, 2011).

Teaching quality or outcomes are harder to measure, especially at the level of the individual faculty member. Institutionally administered instructor and course evaluations filled out by students have been applied to these purposes but are not generally available to the public in Ontario. The website RateMyProfessors.com, which allows students to rate their professors on dimensions of easiness, clarity, helpfulness and overall quality, is one of the only publicly available multi-institutional sources that relates to student assessments of their professors. While some studies find evidence that RateMyProfessors ratings are correlated with official student evaluations of teachers (Timmerman, 2008) and are reflective of student learning (Otto, Sanford & Ross, 2008), many faculty members believe that course difficulty, course workloads and grading are likely to bias student evaluations (March, 1987) and that course grades (or expected course grades) are positively correlated with course evaluations (March & Roche, 2000; Griffen, 2004). Moreover, the RateMyProfessors database is incomplete, with many professors not rated or rated by very few students with no method to deal with sample bias.[10]

Regarding research, there are some more generally accepted and tested traditions for assessing impact through measurements of research funding levels and through bibliometric analyses that use a combination of publication volumes and citations analysis.

Internationally, the major university ranking services incorporate measures of research impact at the institutional level: Times Higher Education World Rankings and Academic Ranking of World Universities (Shanghai) incorporate research funding levels, publication volumes and citations analysis; QS World Universities uses citations analysis in its mix of indicators.

Web-based tools such as Proquest, Google Scholar, Scopus and Web of Science have made the examination of publication volumes and citation-based impact at the individual faculty member level widely accessible in recent years. In Canada, Higher Education Strategy Associates (HESA) applied the Hirsh (H) index, developed by Jorge Hirsh in 2005, to analyse pan-Canadian research outputs. The H-index combines both the number of articles published by a given researcher and the number of citations of those articles in a single parameter. The results of the HESA study can be reported by province, by discipline or by institution. HEQCO published HESA's H-index scores for Canadian provinces in its

[9] In this study, and in the previously published four-institution pilot, a course is defined as being one semester in length. For consistency, the teaching provisions in the collective agreements we reference above have all been converted to this basis.

[10] For a more comprehensive student-managed rating survey at one Ontario university, see the Anti-Calendar compiled by the Arts and Science Student Union at the University of Toronto (http://assu.ca/anti-calendar/). In 2011, the Governing Council of the University of Toronto approved a new student evaluation policy for the university that includes provision for student access to the results (http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/studenteval.pdf)

Productivity Report (HEQCO, 2012) and for Ontario universities in its report on university differentiation (Weingarten et al., 2013).

The Canadian and US studies cited above have used a variety of approaches to measure teaching and research workloads and impacts. Looking at them collectively, there is some suggestion that, despite a general expectation that faculty members will apportion their time to the 40/40/20 normalized distribution of work between teaching and research and service, there may be considerable workload variations both between institutions and between individual faculty members.

This Study

The best information with which to conduct an examination of faculty workload and impact resides with the universities themselves. They presumably have complete data through their administrative systems and departmental records on teaching loads, research output and total compensation for their faculty, together with all secondary information (such as type of appointment and rank, length of employment, additional administrative duties assigned, or sabbatical status) necessary to conduct a comprehensive study of workload. They are also well positioned to link this data with bibliometric and other measures of research output and research impact to assemble a complete picture of what faculty members do, what they contribute and how much they are paid.

Since these administrative data are not available to the public, our study uses publicly available data harvested from 10 publicly funded Ontario universities to examine teaching loads, research volume and impacts, and compensation, in three selected departments.

The study uses universities' departmental websites to create a listing of assistant, associate and full professors in the three selected departments – economics, chemistry and philosophy – at 10 universities. The 10 are selected to include a range of sizes and research intensities from among the subset of Ontario institutions that publish all of the necessary data on their websites. Table 1 provides an overview of Ontario's 20 publicly funded universities and highlights the 10 that are included in the study. The three selected departments represent an illustrative cross-sectional sample from the sciences, social sciences and humanities.

The results from the 10 universities included in this study are colour-coded on the basis of their observed research and graduate intensity as revealed in HEQCO's report on differentiation among Ontario's universities (Weingarten et al., 2013).

Toronto	Research-Intensive	In between	Mostly Undergraduate
Toronto	McMaster Ottawa Queen's Western	Carleton Windsor	Brock Lakehead Laurier

Note: For Toronto, the St. George campus and the Mississauga campus were included for economics and only the St. George campus was included for chemistry and philosophy.

Our study assembles a record of undergraduate and graduate teaching loads from public institutional course calendars. Web-based bibliometric analysis of publications, cross-checked against CVs for each faculty member included in the study, provides a relative measure of research volume and citation impacts. Lastly, Ontario's public salary disclosure listings are mined to determine the salary levels for faculty members making over $100,000 per year, which captures 82% of faculty members in the sample.

The goal of this study is to better understand the teaching and research patterns of faculty members and whether there exist differences across the universities in our study. We focus on the teaching and

research activity of assistant, associate and full professors. We acknowledge that a department is made up of additional faculty members and instructors, like full-time lecturers, contract and sessional staff, visiting professors and emeritus faculty. However, full-time assistant, associate and full professors are most likely to be engaged in both teaching and research. Moreover, these tenure-track and tenured faculty members represent a long-term (as much as 35 years) employment and financial commitment by the university.

Table 1: Overview of Ontario's 20 Publicly Funded Universities by Cluster

	University	FT enrol-ment	% Graduate students	Sponsored research income ($000)	FT faculty	Median salary for FT faculty	Academic salaries as a percentage of operating expenses
	University of Toronto	**67,271**	**20%**	**$915,661**	**2,449**	**$136,483**	**24%**
Research Intensive	University of Guelph	20,730	11%	$153,068	763	$127,307	32%
Research Intensive	**McMaster University**	**24,328**	**14%**	**$325,946**	**936**	**$131,696**	**38%**
Research Intensive	**University of Ottawa**	**31,789**	**14%**	**$276,220**	**1,273**	**$115,839**	**26%**
Research Intensive	**Queen's University**	**19,576**	**19%**	**$163,280**	**841**	**$133,395**	**31%**
Research Intensive	University of Waterloo	30,501	12%	$146,779	1,093	$127,238	30%
Research Intensive	**Western University**	**32,078**	**15%**	**$218,729**	**1,451**	**$114,835**	**37%**
Between	**Carleton University**	**21,438**	**13%**	**$59,343**	**851**	**$114,413**	**32%**
Between	Ryerson University	20,775	9%	$29,518	808	$121,469	22%
Between	**University of Windsor**	**13,181**	**13%**	**$32,129**	**504**	**$116,998**	**33%**
Between	York University	44,325	8%	$65,427	1,475	$126,664	33%
Mostly Undergraduate	Algoma University	921	0%	-	57	-	-
Mostly Undergraduate	**Brock University**	**15,321**	**7%**	**$14,831**	**582**	**$119,472**	**38%**
Mostly Undergraduate	**Lakehead University**	**6,999**	**10%**	**$22,263**	**319**	**$112,392**	**38%**
Mostly Undergraduate	Laurentian University	6,741	6%	$24,447	424	$116,214	-
Mostly Undergraduate	Nipissing University	3,910	1%	-	178	$94,438	39%
Mostly Undergraduate	OCAD University	3,328	2%	-	102	$94,387	34%
Mostly Undergraduate	UOIT	7,752	4%	$10,037	209	$100,441	19%
Mostly Undergraduate	Trent University	6,114	6%	$14,263	237	$119,387	38%
Mostly Undergraduate	**Wilfrid Laurier University**	**15,382**	**6%**	**$12,613**	**534**	**$105,270**	**35%**
	Source	CUDO	CUDO	Re$earch Infosource	CUDO	UCASS	CUDO
	Year of data	Fall 2011	Fall 2011	2011	2011	2010	Fiscal year ended April 30, 2011

* The universities included in our study are listed in bold. Median salaries are for all ranks combined (including deans) and exclude medical and dental faculty members. Academic salaries as a percentage of operating expenses exclude employee benefits.

Description of the Data

We assembled the data for this study from a variety of publicly available sources:

Faculty Lists

We use departmental websites at each university to create a list of faculty members and their rank. For the purposes of this study, full-time faculty members who are assistant, associate and full professors are included since they are most likely to be engaged in both teaching and research.[11] Postdoctoral fellows, lecturers, contract or sessional staff, emeritus faculty, visiting faculty, adjunct faculty and associated members of the department are excluded from the analysis. We recognize that a significant amount of teaching and research activity is undertaken by these faculty members, as well as by other employees of the universities. Although we do not examine their contributions in the same detail, we do indicate the percentage of courses in each of our selected departments taught by these instructors. We also collect information on gender and on PhD attainment – both years since completion and the geographical origin of attainment.

Teaching

Some studies, such as the Faculty Productivity and Costs at the University of Texas at Austin report (Musick, 2011), use student credit hours to examine teaching productivity. Student credit hours incorporate both the number of hours or courses taught and the number of students in each class to impute a faculty member's teaching contribution. Some might argue that a faculty member teaching fewer hours (or courses) but to larger classes is making a larger teaching contribution than a faculty member teaching more hours (or courses) to smaller section sizes. Others would question this conclusion. It is also difficult to estimate the relative actual per-student workloads associated with different sizes of class (factoring in marking, assistance, tutorials), as this will necessarily be a function of the number of teaching assistants available to the instructor, the mode of assessment, and other variables. Practically, information on class size was not available to us across our sample of departments and institutions, so we report instead the number of undergraduate and graduate courses taught to construct a measure for teaching workload. In this, we are consistent with the approach used by the four-institution pilot, which was based on administrative data.

We recognize that faculty members have other teaching responsibilities besides credit courses, such as unassigned courses, preparing for lectures, office hours, student advisement, and undergraduate and graduate student supervision. Information on these activities is not publicly available and rarely even

[11] As noted earlier, we acknowledge the emergence of "teaching-only" or "teaching-stream" professors at some Ontario universities. These faculty members are generally expected to teach more and research less than their traditionally deployed colleagues. This is an example of the very type of differentiation and strategic deployment one might wish to foster in the system. We excluded faculty members who were identified by the universities as teaching-only faculty from our study. Similarly, we also recognize that there are full-time faculty members who are lecturers. Their teaching loads are heavier in comparison to assistant, associate, and full professors and they typically do not engage in the same level of research activity. They are also excluded.

measured, and is therefore not included in our construction of faculty workload. Our counting of teaching loads by counting "courses" taught is consistent with the four-institution pilot reported to us by the Council of Ontario Universities in our preliminary productivity report.

While we are able to measure teaching volume by examining the number of courses taught, we are unable to capture measures of teaching impact, such as institutionally run student evaluations, as these are also not public.

Data on teaching workloads were obtained through publicly available course timetables hosted on departmental websites or with the office of the registrar. We include both undergraduate and graduate courses offered during the fall and winter term of the 2012-2013 academic year. Each semester-long, for-credit course is considered one course. Courses offered for the full year (fall and winter term) are counted as two courses and courses running for half a semester are counted as half a course. Only lectures, seminars and labs worth credit are included in course counts. Tutorials, discussion groups, courses offered through distance education and certain courses like departmental seminars, undergraduate research projects or essays and supervision of master's or PhD theses are not included even though some universities specifically assign a faculty member to these duties.

To prevent double counting, we referenced undergraduate and graduate calendars to identify cases where an instructor was teaching two courses on the same date at the same time for a given semester. In these cases, the two courses were counted as one for the purpose of constructing a faculty member's course load. In cases where a faculty member teaches two or more sections of the same course, each section was counted separately as a course contributing to that faculty member's course load. Team-taught courses are divided by the number of faculty members teaching the course. In some cases, faculty members within our sample taught courses in another department; these courses are taken into account when determining teaching workloads.

Departmental websites differ in terms of how and when they are updated to indicate when a faculty member is on leave or on sabbatical. Even when departmental websites are updated frequently, the period for which a faculty member is on leave or on sabbatical does not necessarily match up with the academic year. We therefore only include faculty members who taught at least one course during the fall or winter term of the 2012 academic year when constructing average course loads. Faculty members who went on leave or on sabbatical midway through the academic year would still be included, given that they taught at least one course. We include departmental chairs and other faculty members with administrative duties when constructing a department's average course load and acknowledge that the teaching load of these faculty members is often reduced to account for their increased administrative duties.

Another limitation to this part of the analysis is the possibility that the publicly available course timetables may not reflect late course assignment changes and cancelled courses, and may not be entirely complete. Course timetables were checked twice: once in the middle of the fall semester and

once again in the winter semester to ensure that cancelled courses[12] or course assignment changes were captured properly. In some cases, the winter course timetables were not entirely complete when collecting the data during the middle of the fall semester, so it was necessary to recheck the timetables for accuracy.

Research

For research productivity, we measure both research volume and research impact. Our analysis focuses on more recent, as opposed to lifetime, research productivity. As such, we look at the number of articles published and their associated citations from 2007 to 2012.

For economics and philosophy, we include only articles published in peer-reviewed journals. We do not include other research activity such as books, book chapters, conference presentations, case studies, reviews and contributions to workshops. We use ProQuest, cross-referenced with faculty member curricula vitae (CVs)[13], to construct a list of peer-reviewed publications for each faculty member in our sample. ProQuest[14], which is part of the Cambridge Information Group, is a bibliographic database of scholarly journals, reports, magazines, books, newspapers, conference papers and proceedings, and other sources.[15] In some cases, articles listed on faculty member CVs that are peer-reviewed are not listed on ProQuest. We verify that these articles are published in the appropriate journal before including them in the publication count.

While ProQuest gives good coverage for the peer-reviewed articles of our sample of faculty members in economics and philosophy, we found it is less reliable for our sample of faculty members in chemistry. Instead, we use Google Scholar cross-referenced with publication lists hosted on departmental websites or faculty research groups[16] to construct a list of publication counts. Google Scholar is a search engine that contains both peer-reviewed and non-peer-reviewed journals in addition to other bibliographic metrics such as scholarly books, book chapters, workshop materials, conference proceedings and other sources. Since Google Scholar does not have an option to only search through peer-reviewed journals, peer-reviewed journals as well as non-peer-reviewed scholarly or scientific journals are included. The following sources are excluded despite appearing on Google Scholar: conference proceedings, abstracts, books, book chapters, workshop materials, bulletins, encyclopedia materials and symposium series.

[12] Our estimates could potentially be overstated, as cancelled courses are not always indicated on course timetables. It is more common for a course to be cancelled due to low enrolment than for a course to be added at the beginning of the semester.
[13] For philosophy, PhilPapers was also used to cross-reference faculty members' CVs and the publications listed on ProQuest. PhilPapers is a database that contains journal articles and books in the field of philosophy.
[14] ProQuest includes EconLit, which is published by the American Economic Association and is a database that focuses on economics-related literature, and Philosopher's Index, which is a database that focuses on philosophy-related literature.
[15] When using ProQuest, we used the option to search through peer-reviewed scholarly journals only.
[16] The vast majority of faculty members in our sample had a publication list posted on either the departmental website or on their research group site. This list was cross-referenced with a search on Google Scholar. In some cases, there was a publication on Google Scholar that was not included on the faculty member's publication list; these publications were included when we constructed our publications count, because publication lists on departmental websites or on their specific research group website may not be updated or only contain select publications. However, if a publication was listed on their publication list but could not be found on Google Scholar, it was not included in the analysis.

To measure research impact for economics and chemistry, Google Scholar is used to determine the number of citations for each publication from 2007 to 2012. Due to much lower citation counts in philosophy we used a different approach to measure research impact by determining whether an article was published in a top philosophy journal. We selected seven journals that were identified as the top philosophy journals by both The Leiter Reports: A Philosophy Blog[17] and The Brooks Blog[18], which formulate their lists based on reader votes.[19] For consistency, citation data were extracted during the same month for all three departments.

Given that fields of study differ in terms of their publishing culture, we stress that cross-departmental comparisons are inappropriate. It would be misguided, for example, to draw any conclusions by comparing the number of publications of the average chemist relative to the average philosopher. Similarly, cross-departmental comparisons in teaching load are also suspect. Departments differ in terms of the way they teach, how they assess and how they may distribute their teaching resources. The most relevant comparisons are inter-institutional ones within each of the departments. This is how the data are presented in this report.

Salaries

Salary data for individual faculty members were obtained from the Ontario Ministry of Finance website. While comprehensive data are not publicly available for all faculty members, the Ontario Ministry of Finance publishes public sector salaries for individuals earning $100,000 or more within a given calendar year (the “sunshine list”). Although not all salary information is captured, a significant proportion of our sample (just over 80%) earned more than $100,000 in 2012. As mentioned earlier, since departmental websites are not necessarily updated frequently to indicate which faculty members are on leave or when, faculty who are not on the sunshine list, especially for higher ranks, may be absent from the list for reasons other than annual salaries of less than $100,000.

[17] The Leiter Reports: A Philosophy Blog is a blog by Brian Leiter, a professor of jurisprudence and Director of the Center for Law, Philosophy & Human Values at the University of Chicago. He constructed a list of the top 20 ‘general’ philosophy journals through a voting process including 540 votes in the spring of 2012.

[18] The Brooks Blog is a blog by Thom Brooks, who is a reader in law at Durham Law School and an associate member in philosophy at Durham University. Brooks’ rankings were based on more than 36,000 votes.

[19] The top seven journals are (in alphabetical order): Ethics, Journal of Philosophy, Mind, Nous, Philosophy & Phenomenological Research, Philosophical Review, and Philosophical Studies.

Observations

Findings for each of the three departments sampled are reported separately. Academic practices vary by field of study. For example, the typical volume of publication varies significantly across the three, and they weigh and value modes of knowledge dissemination differently based on disciplinary cultures. For this reason, the data are analysed department by department and analyses across all three are avoided. We present our findings for each department in the following categories of:

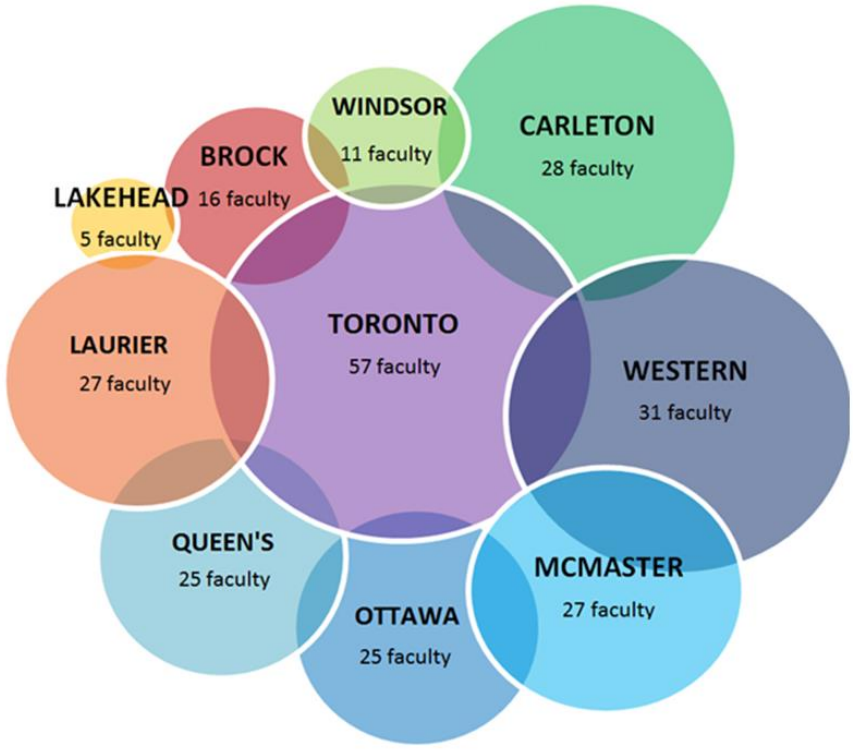
- ***A. Demographics*** – We include information on sample size, rank, gender and PhD attainment characteristics;
- ***B. Teaching*** – We present the average number of undergraduate and graduate courses taught during the fall and winter term of the 2012 academic year, as well as the proportion of courses taught in each department by assistant, associate and full professors;
- ***C. Research*** – We present three measures of research activity from 2007 to 2012: (1) the aggregate Tri-Council funding received by faculty members within our sample, (2) the median number of publications as a measure for research volume, and (3) the median number of total citations to capture research impact;
- ***D. Salaries*** – We provide information on median salaries for faculty members who earned more than $100,000 in 2012, and the proportion of faculty members who were on the sunshine list;
- ***E. Rank*** – We explore differences in earnings, teaching workloads and research patterns by rank;
- ***F. Comparison of research-active and research non-active faculty*** – We examine the share of faculty members who are research non-active and explore differences in teaching and research patterns between research-active and non-active faculty; and
- ***G. Summary*** – Summary of results

Economics

A. Demographics

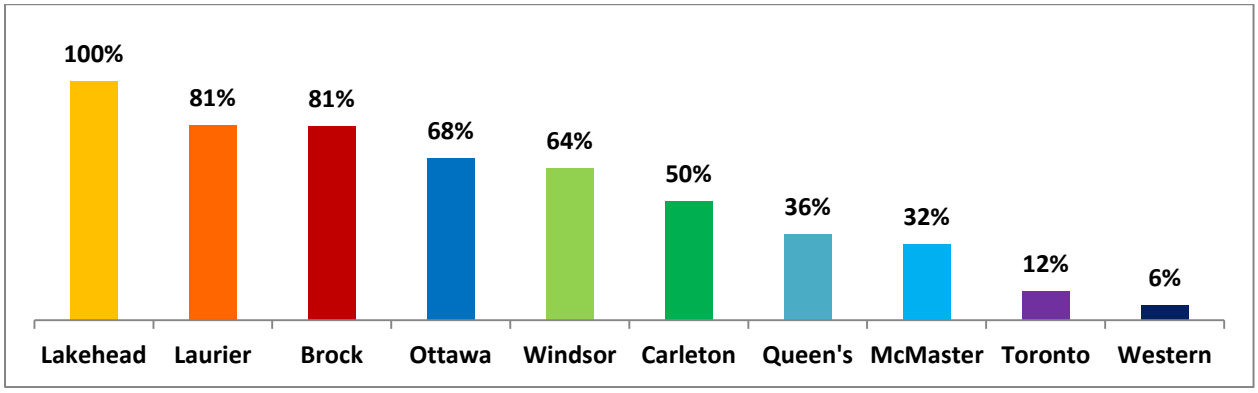
For our economics sample, we have 252 faculty members who are assistant (25%), associate (32%) or full professors (43%). The following figure presents an overview of the number of faculty members within the economics department at each of the 10 universities analysed in this study. In this figure and throughout the remainder of the paper we maintain the same colour coding scheme introduced on page 8 to represent the diversity of the included universities on the basis of observed research and graduate intensity.

Figure 1: Economics – Number of Faculty Members



Approximately 83% of our sample is male. The median number of years since PhD attainment, which we use as a proxy for experience, is 4 for assistant, 12 for associate, and 28 for full professors. Around 42%[20] of faculty members in our sample have obtained their PhD from a Canadian university. The following figure shows that there is a substantial difference in faculty composition in terms of the share of faculty members who obtained their PhD from a Canadian university across the 10 institutions in our study.

Figure 2: Economics – Share of Faculty Members with a PhD from a Canadian University



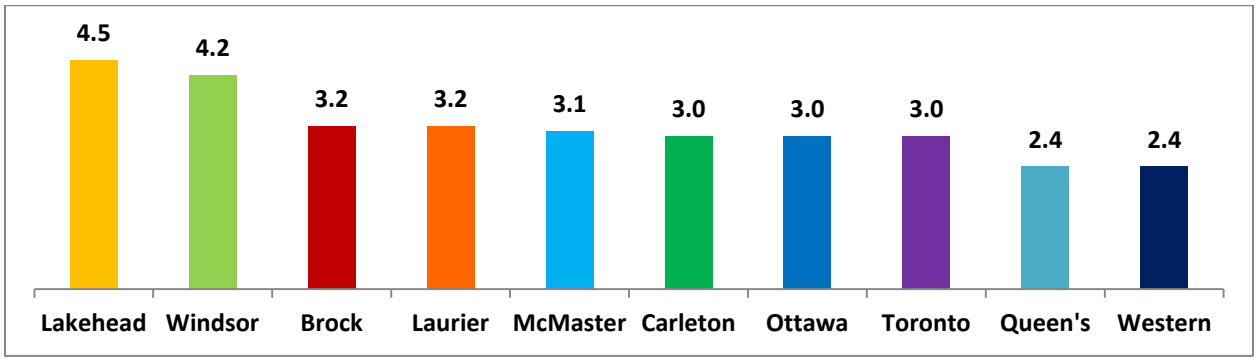
[20] This percentage excludes two faculty members who do not hold a PhD.

These results coincide with recent work by Frances Woolley and Anindya Sen, who investigated the educational background of economics professors in Ontario.[21] Woolley argues that one of the reasons why universities have been hiring more professors who hold a PhD from a non-Canadian university is to compete globally. The universities in our study that have the smallest proportion of faculty members with a PhD from a Canadian university are the ones that typically place higher in the world university rankings[22], and also the ones observed by HEQCO's examination of the diversity among Ontario's universities as being more research-intensive (Weingarten et al., 2013).

B. Teaching

Focusing first on teaching workloads, the average number of undergraduate and graduate courses taught during the fall and winter terms of the 2012 academic year is presented below for assistant, associate and full professors. Each semester-long course is counted as one course. As mentioned in the Description of the Data section, since we could not easily identify faculty members who were on leave or on sabbatical during the 2012 academic year, we only include faculty members who taught at least one course.[23]

Figure 3: Economics – Average Number of Undergraduate and Graduate Courses Taught in the Fall and Winter Terms of the 2012 Academic Year



The average number of courses taught for all faculty members within our sample is 3.0. There is considerable variation in the average number of courses taught across the 10 universities in our study. Faculty members at Lakehead and Windsor have the highest average teaching loads, while Queen's and Western have the lightest average teaching loads.

[21] The data on geographical origin of PhD attainment were presented in a blog by Frances Woolley (http://worthwhile.typepad.com/worthwhile_canadian_initi/2013/04/the-slowly-changing-face-of-ontario-economics-departments.html). The data are based on 109 assistant, 134 associate, and 154 full professors in economics in Ontario and were collected from publicly available sources. The findings are that while just over 50% of associate professors in economics hold a PhD from a Canadian university, the share is much lower for assistant and full professors in economics at just over 40%.

[22] Based on the Times Higher Education World University Rankings for 2013, the following universities in our sample were ranked in the top 250 schools (rank is listed in parentheses): University of Toronto (20), McMaster University (92), University of Ottawa (185), Queen's University (226-250) and Western University (226-250). With the exception of the University of Ottawa, these universities have a smaller share of faculty with a PhD from a Canadian university compared to the other universities in our study. Similar results hold when using the Academic Ranking of World Universities.

[23] From our sample of 252 faculty members, 30 taught zero courses during the fall and winter terms of the 2012 academic year. These faculty members were not included when calculating the average course load per department.

The following table presents the share of economics courses taught by assistant, associate and full professors.[24] The proportion of economics courses taught by the faculty members included in our sample ranges from around 50% to 85%. While assistant, associate and full professors teach just over half of all undergraduate courses (with the exception of Laurier and Windsor where these faculty members teach over 80% of undergraduate economics courses), these faculty members teach the majority of graduate courses. The percentage of economics courses taught by other faculty members include sessional and contract lecturers, full-time lecturers, postdoctoral fellows, graduate students, emeritus faculty, visiting faculty, adjunct faculty and associated members of the department. Focusing on all the economics courses offered collectively across the universities in our sample, just over 60% are taught by assistant, associate and full professors.

Table 2: Share of Economics Courses Taught by Assistant, Associate and Full Professors During the Fall and Winter Terms of the 2012 Academic Year

% of Economics courses taught by:				
	Assistant, Associate and Full Professors			Other Faculty
	Undergraduate courses	Graduate courses	All courses	All courses
Laurier	83%	100%	84%	16%
Windsor	80%	100%	84%	16%
McMaster	69%	96%	75%	25%
Western	62%	100%	70%	30%
Brock	63%	100%	66%	34%
Queen's	48%	87%	61%	39%
Lakehead	54%	89%	60%	40%
Ottawa[25]	49%	92%	58%	42%
Carleton[25]	48%	95%	57%	43%
Toronto	46%	74%	51%	49%
Overall	**57%**	**89%**	**63%**	**37%**

C. Research

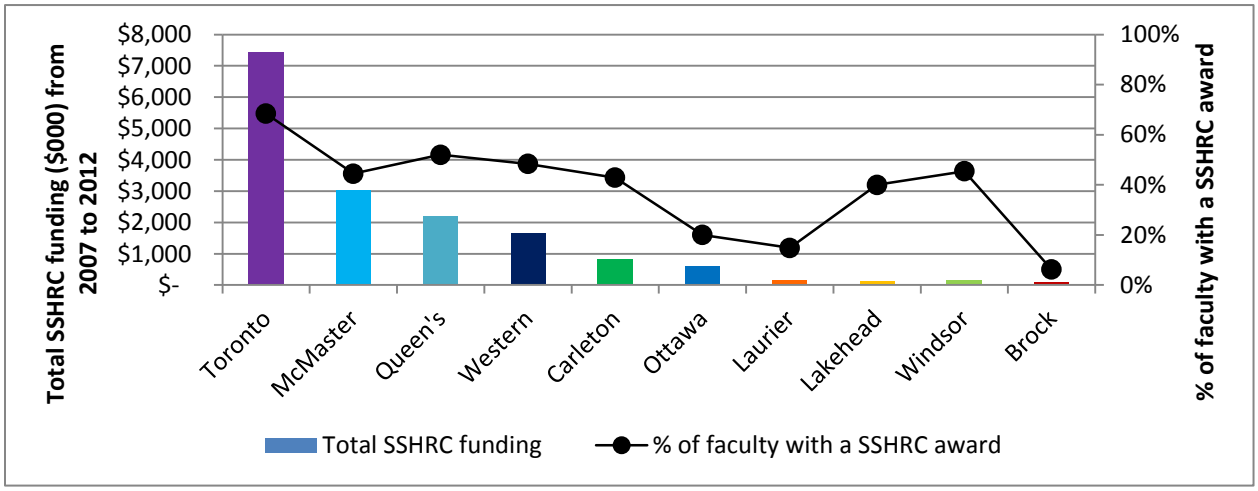
We begin our examination of research activity by reviewing the value of externally funded research grants from the Social Sciences and Humanities Research Council (SSHRC), which is the main source of Canadian Tri-Council funding for economics. The following figure presents the aggregate SSHRC funding awarded to individual faculty members within our sample from 2007 to 2012 and the proportion of faculty members who held at least one SSHRC grant at some point during the same reference period.

[24] There are cases where faculty members teach courses outside their department. These courses were not included when determining the share of economics courses taught by the faculty members in our sample, but they are included in determining the total teaching course load for each faculty member.

[25] We note that Carleton University and the University of Ottawa operate a joint economics program at the doctoral level. We show separately the teaching contribution of each of the two universities on their respective campuses towards the joint venture.

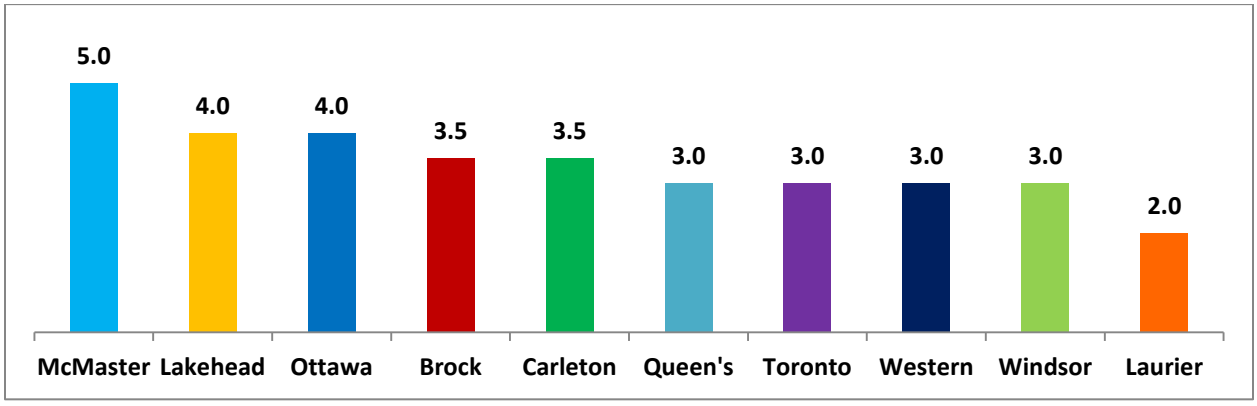
With the exception of McMaster, the economics departments that received the largest amount of SSHRC funding collectively had the lightest average teaching workloads in the 2012 academic year.

Figure 4: Economics – Aggregate SSHRC Funding and the Percentage of Faculty Members who Held at least one SSHRC Award from 2007 to 2012



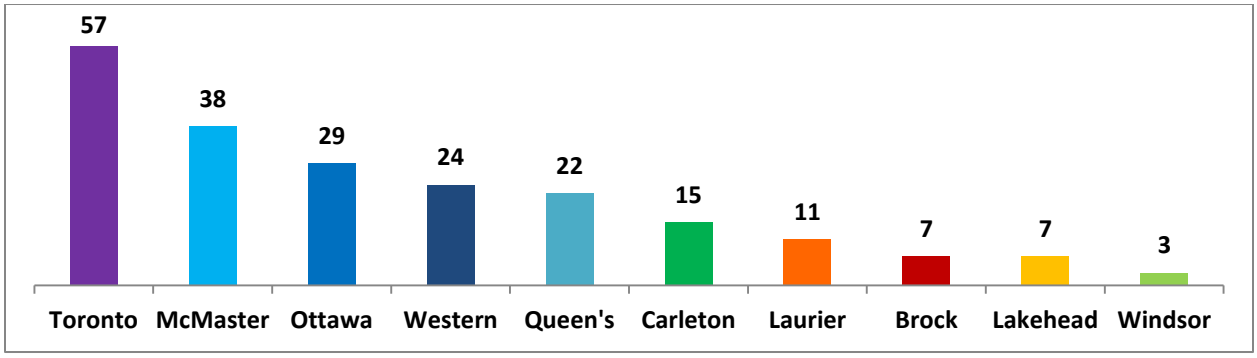
Our second approach to the examination of research activity in our sample is through the number of publications in peer-reviewed journals. The following figure presents the median number of publications per faculty member over the six-year period from 2007 to 2012.

Figure 5: Economics – Median Number of Publications per Faculty Member from 2007 to 2012



Research impact is not necessarily a function of research volume. The following figure presents the median number of total citations per faculty member associated with the publications in peer-reviewed journals from 2007 to 2012.

Figure 6: Economics – Median Number of Total Citations per Faculty Member Associated with the Publications from 2007 to 2012

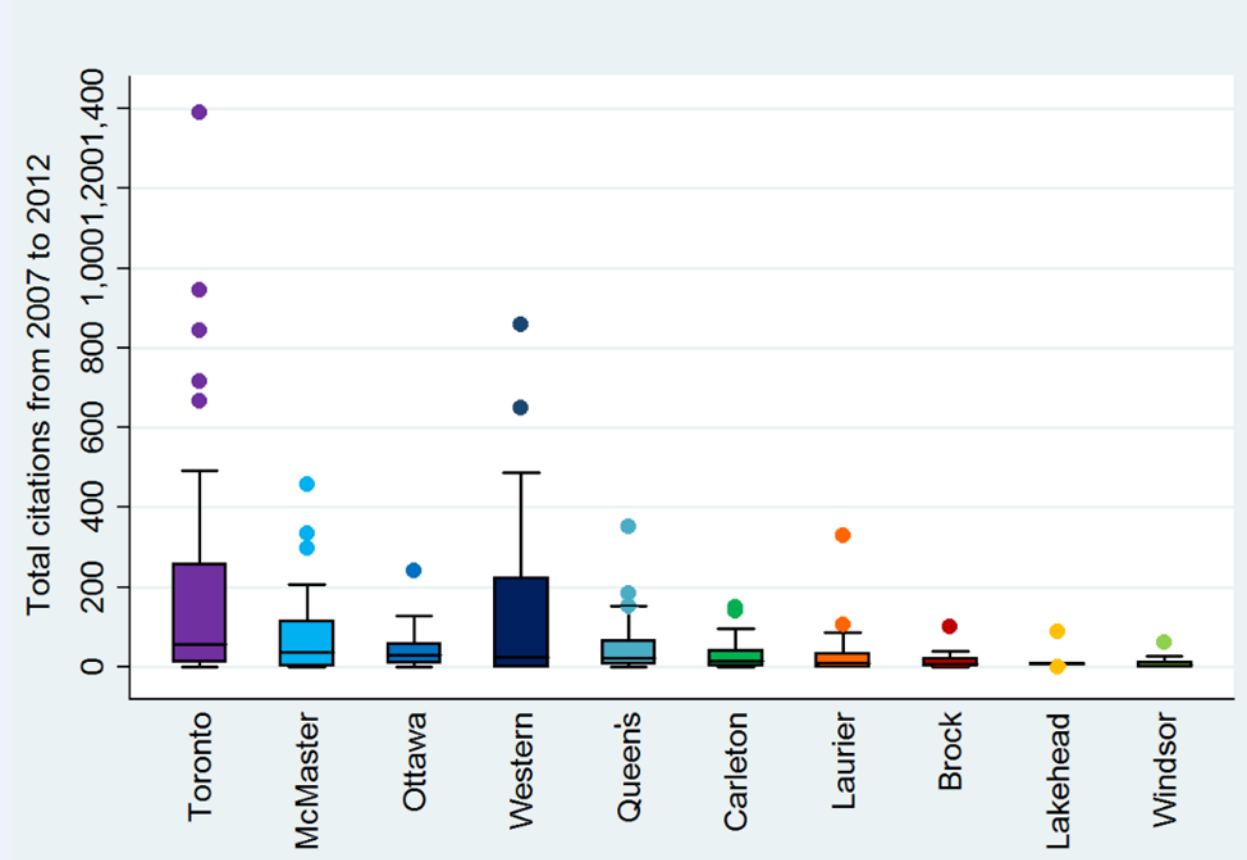


We present data on the median number of publications and their associated citations rather than the average. Some universities have "superstar" researchers who have been heavily cited since 2007, just as some universities, who might be expanding their economics department, might have a higher share of assistant professors. As such, the median provides a better representation of the entire department. However, to provide a more detailed overview of research impact, the following boxplots show the distribution of total citations for each university.

The box displays the interquartile range (IQR) of citations per faculty member for each of the universities. The bottom of the box represents the first quartile (i.e., citation volume for faculty members at that institution at the 25th percentile) and the top of the box represents the third quartile (i.e., citation volume for faculty members at that institution at the 75th percentile). The median is located in the middle (and is the same as the value shown in Figure 6). The whiskers (the upper and lower adjacent values) show the values within the 1.5 IQR of the lower and upper quartile.[26] In other words, the whiskers represent the upper and lower volumes of the distribution of citations excluding any outliers, which are shown separately as the data points above or below the whiskers. In most cases, the boxplots for each university show a positive skew, as the median is closer to the bottom of the box.

[26] The IQR for each university is simply the length of the box. It is common practice in statistics to identify values that are more than 1.5 times the IQR beyond the box borders as outliers. Placing the whiskers at these upper and lower boundaries helps do exactly that.

Figure 7: Economics – Distribution of Total Citations across Faculty Members at Each University



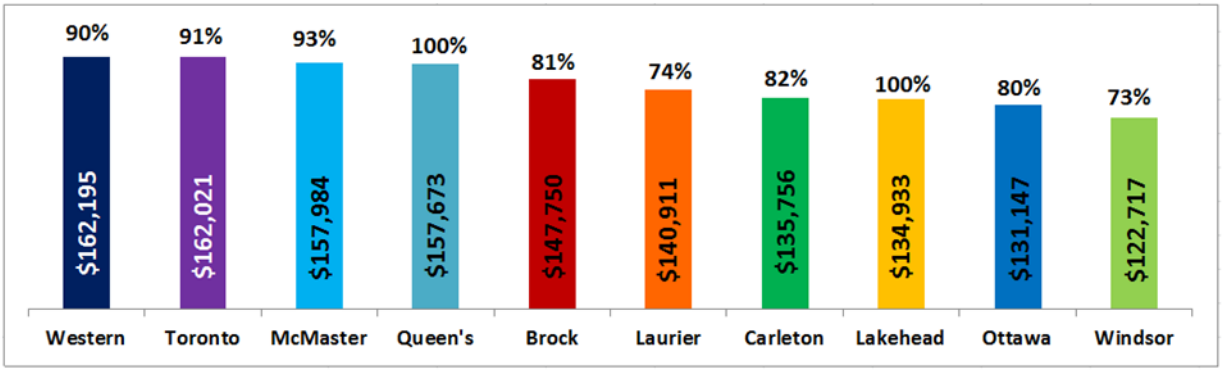
The above graph indicates the presence of "superstar" researchers, as indicated by the outlier data points. Focusing on the top 20 faculty members who have the highest number of total citations, half of them work at Toronto, which also has the largest economics department. Western, which has the second largest economics department, has one-quarter of the top 20 most cited researchers within our sample. McMaster has two faculty members and Queen's and Laurier each have one faculty member within the top 20.

D. Salaries

The following figure shows the median salary by department for faculty members who earned over $100,000 in 2012. The figure also shows the proportion of faculty members who earned over $100,000. It is important to keep in mind that if a faculty member within our sample went on leave or was newly hired, they may not have been on the provincial government's $100,000+ sunshine list for 2012, even though they may have had an annual salary over $100,000.[27] Of our sample of 252 economists, just under 87% were on the sunshine list.

[27] There were 33 faculty members who were not listed on the Ontario Ministry of Finance public salary disclosure list for 2012. Two of these faculty members were full professors who were newly hired (as indicated on their personal CVs). Five were associate professors – two of which taught zero courses during the 2012 academic year, two of which were newly hired and

Figure 8: Economics – Median Salary for Faculty Members who Earned over $100,000 in 2012 and the Proportion of Faculty Members who Earned over $100,000



E. Rank

The following table provides a summary of the workload patterns and earnings for assistant, associate and full professors. Full professors, in general, publish more than either associate or assistant professors and their publications are more frequently cited. Full professors are also more likely to have a lighter teaching load and higher earnings.

Table 3: Economics – Workload Patterns and Earnings by Rank

	Average courses taught	Median publications	Median citations	Median salary (above $100K)
Assistant	3.3	1	8	$122,695
Associate	3.0	4	22	$141,625
Full Professor	2.8	5	39	$164,763

F. Comparison of research-active and research non-active faculty

HEQCO's Productivity Report, which provided the first glimpse of faculty teaching loads using pilot data from four Ontario universities, reveals the presence of research-active and research non-active faculty as defined by the participating universities. For the purposes of the pilot study, the Ontario Council of Academic Vice-Presidents (OCAV) defines research-active faculty as:

(i) Faculty who have research funding in census year; or
(ii) Faculty who have defined research outputs in the specified [census year] time period.

Defined research outputs are those with some expectation of peer-review and directly associated with the discipline expertise of the faculty member. These can include books, book chapters, journal articles,

one who had just been promoted from assistant professor (but previously did not earn above $100,000 in the previous calendar years). The rest were assistant professors and were likely earning below $100,000.

sitting on an editorial board or editing a journal, peer-adjudicated conference presentations and creative activities.

The pilot study included faculty members consistent with the definition of full-time faculty used by the University and College Academic Staff System (UCASS)[28], with the exception of excluding faculty members at the rank of dean or higher. Applying methodology similar to that employed by OCAV for our sample of assistant, associate and full professors, we classify a faculty member as research-active if they received a SSHRC award in 2012 OR if they published at least once in a peer-reviewed journal in 2012 (method 1). We further extend the criteria for classifying faculty members as research-active by widening the time period to two years (method 2) and to three years (method 3).

As we widen the reference period used to classify faculty members, the percentage of research non-active faculty decreases from 45.0% (from method 1) to 27.5% (from method 3). The average number of courses taught is slightly higher for research non-active faculty members compared to research-active faculty members regardless of method. Using our most liberal definition to classify faculty members (method 3), the average number of courses taught is 2.9 for research-active faculty members and 3.4 for research non-active faculty members.

We also look at earnings and teaching and research patterns separately for assistant, associate and full professors to control for differences by rank; this is particularly helpful for assistant professors, who do not have as much research experience as associate and full professors. While research non-active assistant and full professors have slightly higher average course loads and lower median earnings, the results are inverted for associate professors: research non-active associate professors have slightly lower average course loads and higher median earnings.

[28] UCASS includes all full-time teaching staff who have a contract of at least one year, regardless of whether they hold an academic rank. Administrative and support staff and teaching and research assistants are excluded.

Table 4: Economics – Comparison between Research-Active and Research Non-Active Faculty Members

	Method 1		Method 2		Method 3	
	In **2012**, received SSHRC funding or had a publication		In **2011 or 2012**, received SSHRC funding or had a publication		In **2010, 2011 or 2012**, received SSHRC funding or had a publication	
	Research active	**Research non-active**	**Research active**	**Research non-active**	**Research active**	**Research non-active**
% of assistant, associate, and full professors	55.0%	45.0%	64.9%	35.1%	72.5%	27.5%
Average number of courses taught	2.8	3.2	2.9	3.2	2.9	3.4
Assistant Professors						
% who are assistant professors	60.7%	39.3%	54.1%	45.9%	62.3%	37.7%
Average number of courses taught	2.9	3.6	2.9	3.9	2.9	4.0
Median publications from 2007 to 2012	2.5	0	2	0	5	0
Median citations from 2007 to 2012	18	0	18	0	17.5	0
Median salary (>$100K)	$124,779	$118,440	$124,105	$116,673	$123,891	$114,906
Associate Professors						
% who are associate professors	57.1%	42.9%	64.3%	35.7%	70.0%	30.0%
Average number of courses taught	3.1	2.9	3.1	2.8	3.1	2.8
Median publications from 2007 to 2012	5	1	5	1	5	1
Median citations from 2007 to 2012	49.5	5.5	38	2	35	0
Median salary (>$100K)	$140,618	$145,882	$139,293	$147,212	$141,307	$146,640
Full Professors						
% who are full professors	63.7%	36.3%	72.5%	27.5%	81.3%	18.7%
Average number of courses taught	2.6	3.1	2.7	3.0	2.7	3.2
Median publications from 2007 to 2012	6	2	6	1	5.5	0
Median citations from 2007 to 2012	60.5	8	58.5	6	50	0
Median salary (>$100K)	$165,373	$160,403	$165,373	$160,403	$166,062	$160,079

G. Summary

The data reveal that there are differences in the faculty composition, teaching workloads and research patterns across economics departments of the universities in our study. The universities that are more research-intensive have a smaller share of faculty members who hold a PhD from a Canadian university, have a lighter average course load, typically receive more SSHRC funding and have a higher research

impact. The universities that are primarily undergraduate are still engaging in research activity; however, faculty members at these institutions are putting a greater emphasis on teaching and typically have a higher average teaching workload.

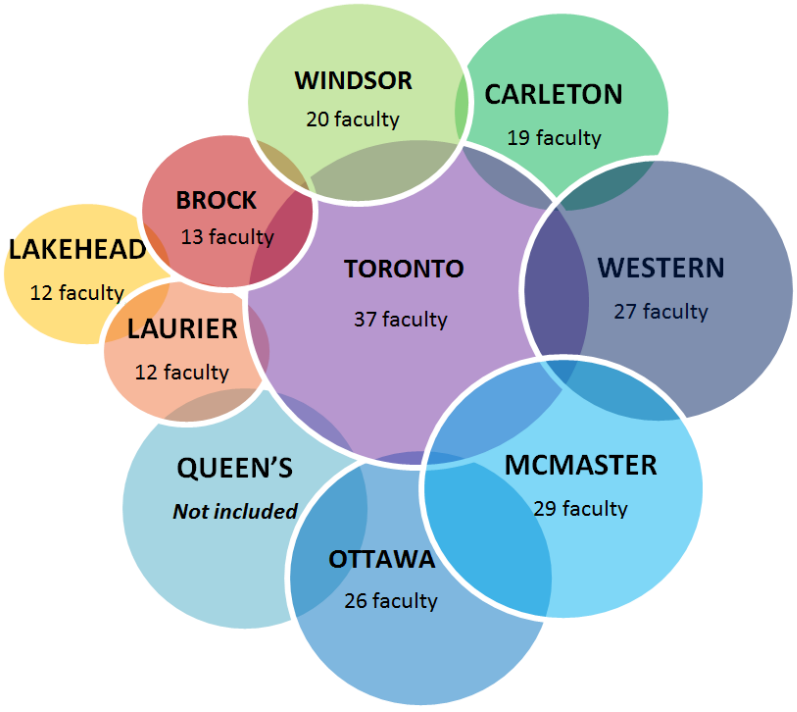
The data also reveal the presence of research-active and research non-active faculty members. By looking at rank separately and even looking at a broader reference period of three years, just under 30% of faculty members are classified as research non-active – these are faculty members who have neither published in a peer-reviewed journal in three years nor have received SSHRC funding in three years. Despite the disparity in research activity (both volume and impact) for research-active and non-active faculty members, the average number of courses taught is slightly higher for research non-active assistant and full professors and slightly lower for research non-active associate professors.

Chemistry

A. Demographics

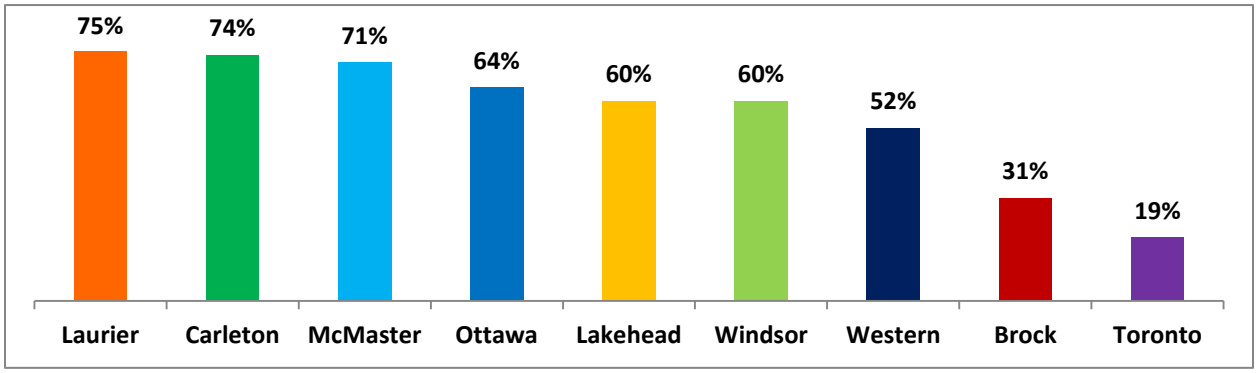
For our chemistry sample, we have 195 faculty members who are assistant (15%), associate (37%) or full professors (48%). The following figure provides an overview of the department size at each of the universities in our study with the exception of Queen's. Queen's is not included in this analysis since we were unable to collect information on teaching workload for their chemistry department**.**

Figure 9: Chemistry – Number of Faculty Members



For chemistry, approximately 84% of our sample is male. The share of faculty members who obtained their PhD from a Canadian university is 53%.[29] Toronto has the smallest share of faculty members who obtained their PhD in Canada, compared to Laurier which has the largest share.

Figure 10: Chemistry – Share of Faculty Members with a PhD from a Canadian University

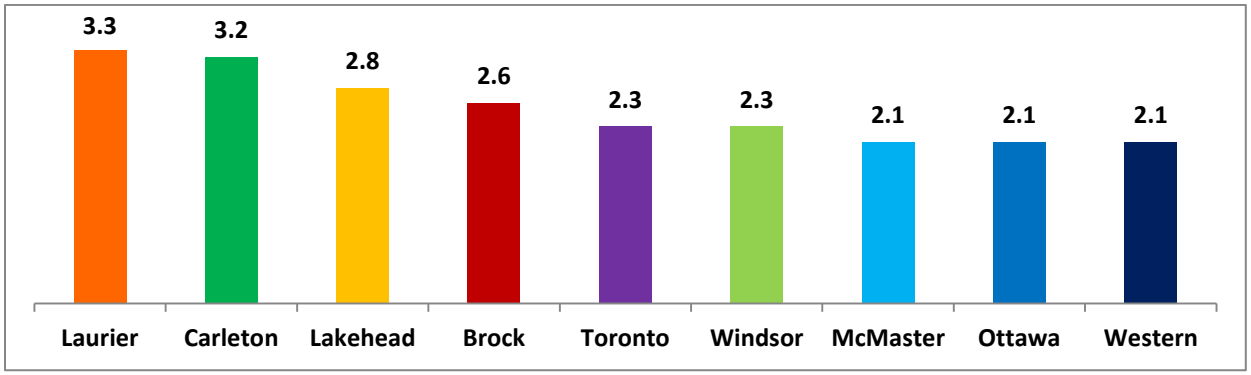


Focusing on the QS World University Rankings by subject in 2013-2014, Toronto, Ottawa and McMaster placed in the top 200 universities in chemistry; however, they do not necessarily have the smallest proportion of faculty members who obtained their PhD in Canada.

B. Teaching

Figure 11 shows the differences in the average course loads across the universities. The average number of undergraduate and graduate courses taught for our chemistry sample is 2.4 courses.[30]

Figure 11: Chemistry – Average Number of Undergraduate and Graduate Courses Taught in the Fall and Winter Terms of the 2012 Academic Year



The following table presents the share of courses offered within the chemistry program that were taught by assistant, associate and full professors. The majority of chemistry courses offered, both

[29] This percentage excludes three faculty members from our chemistry sample for whom we were unable to determine where their PhD was obtained.
[30] Of our sample of 195 faculty members, 27 taught zero courses during the fall and winter terms of the 2012 academic year. These faculty members were not included when calculating the average course load per department.

undergraduate and graduate, are taught by assistant, associate and full professors within our sample. The share of chemistry courses taught by assistant, associate and full professors ranges from 64% to 92%. Looking at all the chemistry courses collectively across the universities in our sample, just over 80% are taught by assistant, associate and full professors.

Table 5: Share of Chemistry Courses Taught by Assistant, Associate and Full Professors during the Fall and Winter Terms of the 2012 Academic Year[31]

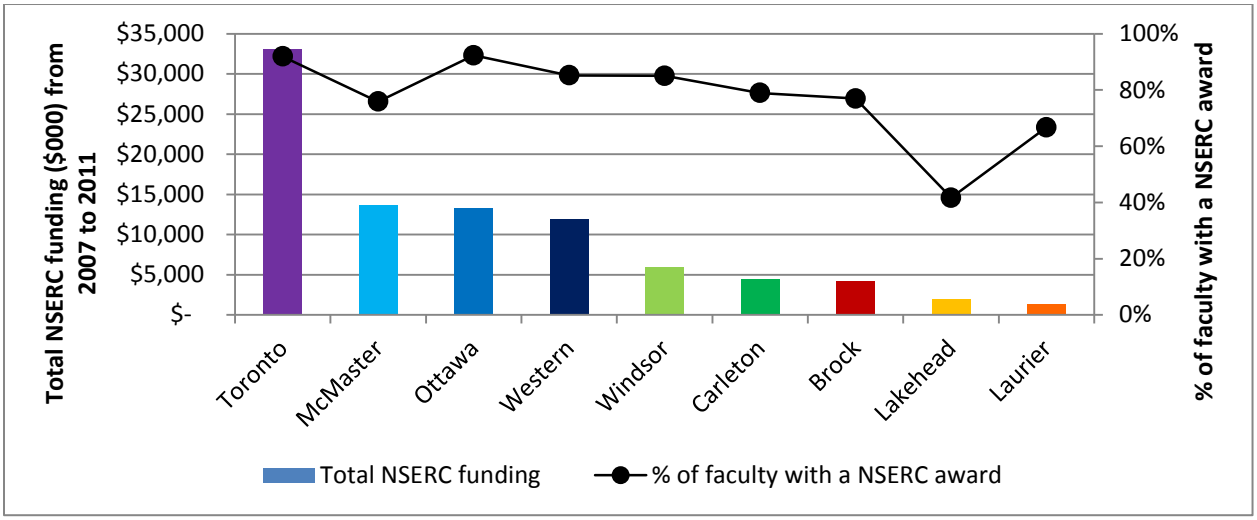
% of Chemistry courses taught by:				
	Assistant, Associate and Full Professors			Other Faculty
	Undergraduate courses	Graduate courses	All courses	All courses
McMaster	91%	82%	92%	8%
Windsor	91%	100%	92%	8%
Carleton	87%	100%	88%	12%
Western	78%	100%	82%	18%
Brock	81%	75%	81%	19%
Lakehead	82%	71%	80%	20%
Ottawa	71%	89%	72%	28%
Laurier	64%	67%	64%	36%
Overall	**80%**	**89%**	**81%**	**19%**

C. Research

Focusing on research activity, the majority of faculty members in chemistry received funding from the Natural Sciences and Engineering Research Council of Canada (NSERC) from 2007 to 2011. The following figure presents the aggregate NSERC funding awarded to individual faculty members within our sample from 2007 to 2011[32] and the proportion of faculty members who held at least one NSERC award at some point during the same reference period.

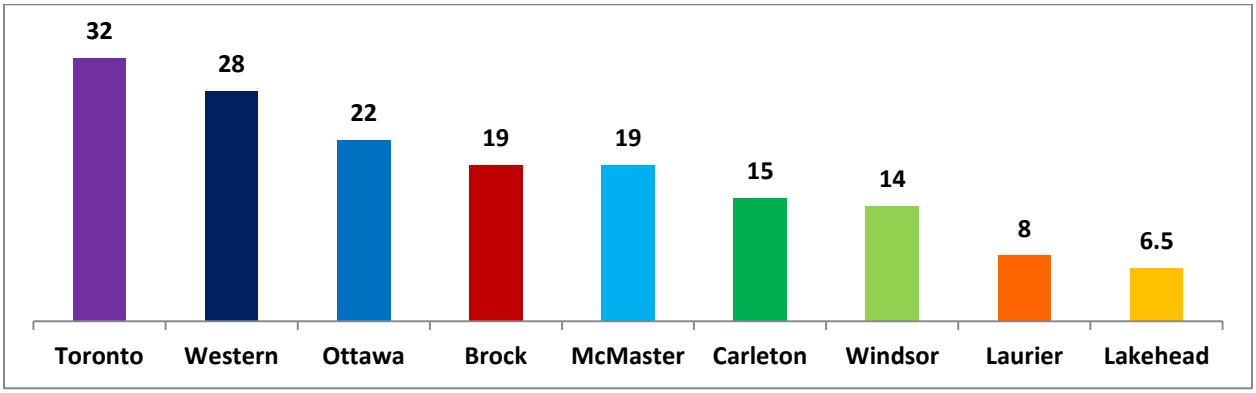
[31] We do not include Toronto in this table. Since we exclude faculty from the Mississauga and Scarborough campuses, if these faculty teach courses at the St George campus as well, this would not be properly reflected in the share of courses taught by assistant, associate and full professors.
[32] NSERC funding for 2012 was not available at the time the data were collected.

Figure 12: Chemistry – Total NSERC Funding and the Percentage of Faculty Members who Held at least one NSERC Award from 2007 to 2011



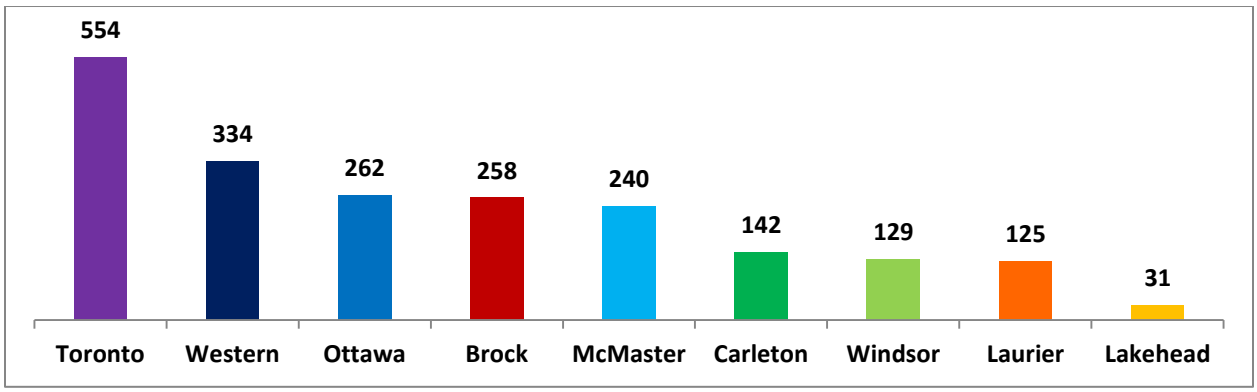
When examining research volume, the faculty members at departments with a lighter average teaching load typically publish more frequently than faculty members at departments with a higher average course load. The following figure presents the median number of publications per faculty member in peer-reviewed *and* non-peer-reviewed scholarly journals.

Figure 13: Chemistry – Median Number of Publications per Faculty Member from 2007 to 2012



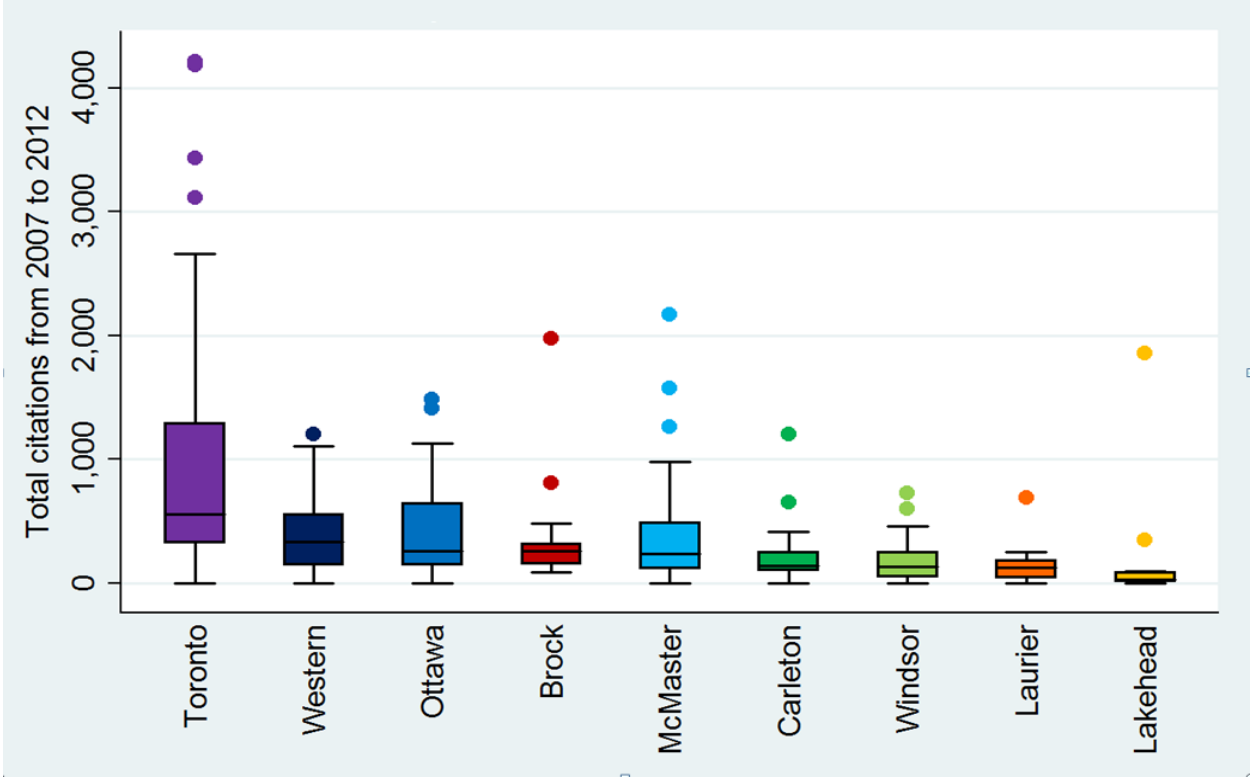
With regard to research impact, the universities that have a higher median number of publications per faculty member also have a higher median number of total citations associated with those publications. The following figure presents the median number of total citations per faculty member associated with the publications from 2007 to 2012.

Figure 14: Chemistry – Median Number of Total Citations per Faculty Member Associated with the Publications from 2007 to 2012



While it is evident that the chemistry department at Toronto has the largest research impact compared to the other universities in our sample, the following boxplots provide a more detailed overview of the distribution of total citations for each department. The box displays the interquartile range with the bottom of the box representing the first quartile, the top of the box representing the third quartile and the middle line representing the median. The whiskers show the values within the 1.5 IQR[33] of the lower and upper quartile.

Figure 15: Chemistry – Distribution of Total Citations across Faculty Members at each University



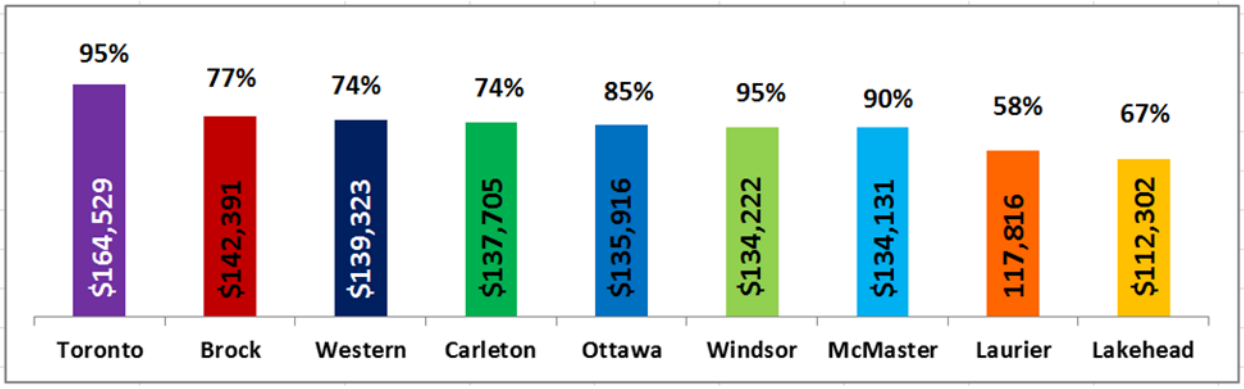
[33] IQR: defined in footnote 25.

Of the top 20 researchers who received the most citations from their publications from 2007 to 2012, half work at Toronto, which also has the largest chemistry department. Three of the top 20 researchers in our sample work at each of McMaster and Ottawa, and one at each of Brock, Carleton, Lakehead and Western.

D. Earnings

Of our chemistry sample of 195 faculty members, just over 82% were on the sunshine list for the 2012 calendar year.[34] The following figure presents the median salary for faculty members who earned over $100,000 and the share of faculty members who were on the sunshine list.

Figure 16: Chemistry – Median Salary for Faculty Members who Earned over $100,000 in 2012 and the Proportion of Faculty Members who Earned over $100,000



E. Rank

In chemistry, full professors typically teach less than associate professors and associate professors typically teach less than assistant professors. Full-time professors publish more and have a larger research impact. There is less of a difference in research patterns between assistant and associate professors. The following table provides an overview of the workload patterns across the three ranks and the median salary within each rank for those who earned above $100,000 in 2012.

Table 6: Chemistry – Workload Patterns and Earnings by Rank

	Average courses taught	Median publications	Median citations	Median salary (above $100K)
Assistant	3.2	13	149	$ 115,323
Associate	2.6	15	158	$ 120,203
Full professor	2.0	25	385	$ 160,011

[34] There were 34 faculty members from chemistry who were not on the Ontario Ministry of Finance public salary disclosure list for the 2012 calendar year. Two of these faculty members were professors, one of which did not teach any courses during the 2012 academic year. There were 11 associate professors who were not on the sunshine list, two of which did not teach any courses. The rest were assistant professors.

F. Comparison of research active and research non-active faculty

The following table provides an overview of the comparison between research-active and research non-active faculty members. The institutionally designed methodology for classifying faculty members as research-active and research non-active used in the four institution pilot published in HEQCO's Productivity Report depends on external funding as well as publications for the census year. We lack NSERC funding for 2012 and instead classify faculty members as research-active if they had a publication in 2012 for method 1. For method 2, we classify faculty members as research-active if they had a publication in either 2011 or 2012 or if they received NSREC funding in 2011. Similarly, for method 3, we extend the reference period by a year and classify faculty members as research-active if they had a publication in 2010, 2011 or 2012, or if they received NSERC funding in 2010 or 2011.

By widening the reference period used to classify faculty members, the percentage of research non-active faculty members decreases from 20.2% (from method 1) to 7.1% (from method 3). Research non-active faculty members typically have higher average course loads. Using method 3, the average number of courses taught is 3.3 for research non-active faculty members, compared to 2.4 for research-active faculty members, a difference of about one semester.

We look at differences in teaching and research patterns separately by rank to control for differences in research experience. While research-active full professors have higher median earnings, associate professors who are research-active have slightly lower median earnings compared to research non-active faculty members. It is difficult to make a comparison across salaries of assistant professors as these are faculty members who are not fully captured by the sunshine list.

Table 7: Comparison between Research-Active and Research Non-Active Faculty

	Method 1		Method 2		Method 3	
	In **2012**, had a publication		In **2011 or 2012**, received NSERC funding or had a publication		In **2010, 2011 or 2012**, received NSERC funding or had a publication	
	Research Active	**Research Non-Active**	**Research Active**	**Research Non-Active**	**Research Active**	**Research Non-Active**
% of assistant, associate, and full professors	79.8%	20.2%	92.3%	7.7%	92.9%	7.1%
Average number of courses taught	2.2	3.1	2.3	3.4	2.4	3.3
Assistant Professors						
% who are associate professors	60.0%	40.0%	92.0%	8.0%	96.0%	4.0%
Average number of courses taught	2.5	4.1	3.1	3.5	3.2	2.0
Median publications from 2007 to 2012	18	5.5	13	2	12	0
Median citations from 2007 to 2012	185	74	170	38	159.5	0
Median salary (>$100K)	$115,323	$110,039	$112,839	$119,868	$112,839	$119,868
Associate Professors						
% who are associate professors	79.7%	20.3%	92.2%	7.8%	92.2%	7.8%
Average number of courses taught	2.5	2.9	2.5	3.8	2.5	3.8
Median publications from 2007 to 2012	19	3	15	0	15	0
Median citations from 2007 to 2012	217	19	163	0	163	0
Median salary (>$100K)	$120,424	$129,612	$120,947	$128,058	$120,947	$128,058
Full Professors						
% who are full professors	86.1%	13.9%	92.4%	7.6%	92.4%	7.6%
Average number of courses taught	2.0	2.5	2.0	3.1	2.0	3.1
Median publications from 2007 to 2012	28	1	25	1	25	1
Median citations from 2007 to 2012	447.5	14	417	8	417	8
Median salary (>$100K)	$162,075	$146,726	$160,745	$147,522	$160,745	$147,522

G. Summary

The range for the average number of courses taught within each university's chemistry department differs by about 1 course. The data reveal that there are substantial differences in terms of research volume and research impact. Using the clusters observed in HEQCO's report on the differentiation of Ontario's universities, the universities with the highest average course loads are the universities that were identified as being mostly undergraduate-focused. On the other hand, the universities that had the

highest research impact, with the exception of Brock, were those observed in a cluster of more research-intensive universities.

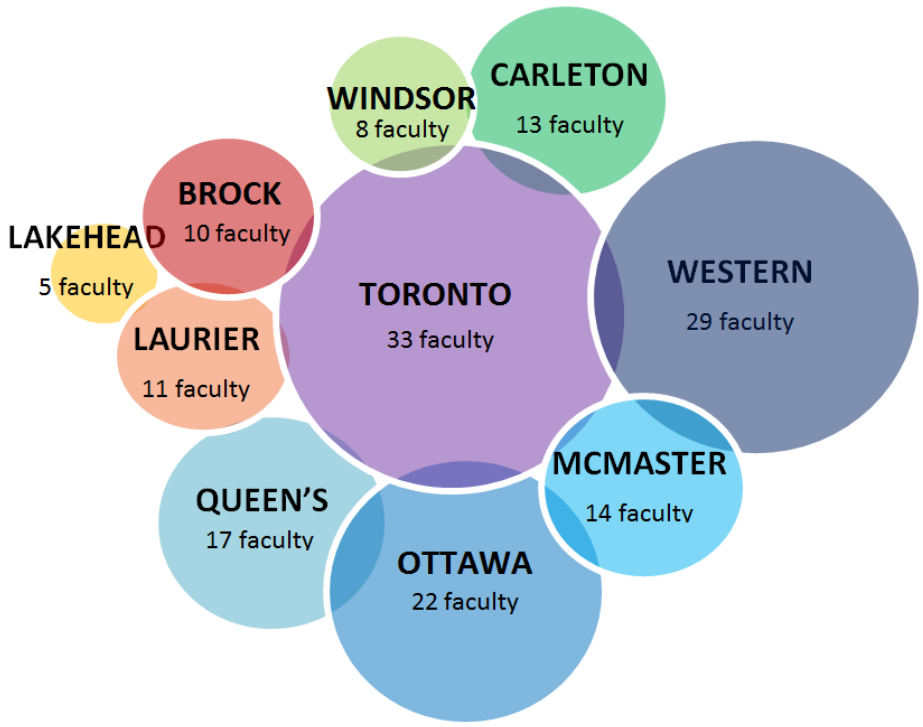
The data also reveal the presence of research-active and research non-active faculty. By looking at a three-year range of research activity, only 7.1% of faculty members were classified as research non-active; these are faculty members who have neither published in a scholarly journal in three years nor have they received NSERC funding in 2010 or 2011. Research non-active faculty members typically have higher average course loads – on average 40% higher – than their research-active colleagues.

Philosophy

A. Demographics

For philosophy, we have a sample of 162 faculty members who are assistant (13%), associate (43%) and full professors (44 %). The following figure provides an overview of the department size at each of the universities in our study.

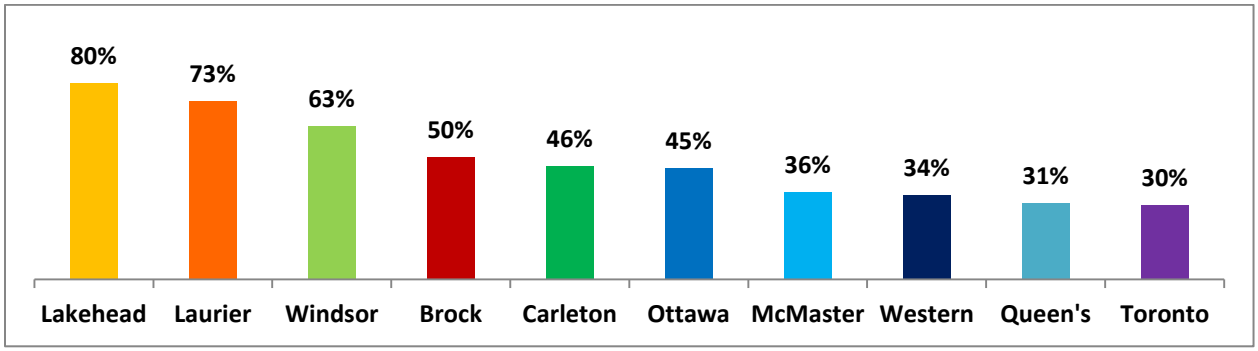
Figure 17: Philosophy – Number of Faculty Members



Just under 70% of our sample is male. The share of faculty members who obtained their PhD from a Canadian university is 42%[35] and is presented below for each university.

[35] This percentage excludes one faculty member for whom information about where the PhD was earned is not available.

Figure 18: Philosophy – Share of Faculty Members with a PhD from a Canadian University

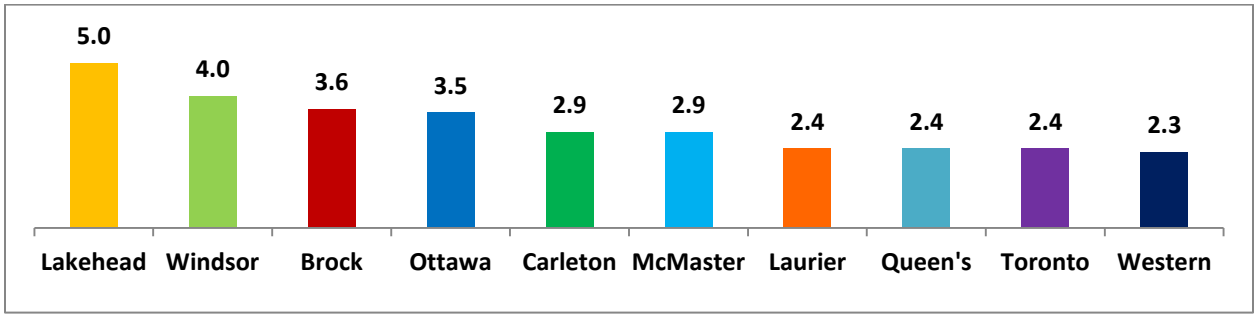


For philosophy, the universities that have a smaller share of faculty members with a PhD from a Canadian university are typically the universities that place higher in the world rankings. Even focusing on the QS World University Rankings by subject in 2013, Toronto, Queen's, Western, Ottawa and McMaster placed in the top 150 universities in philosophy and they also have the smallest proportion of faculty members who obtained their PhD in Canada.

B. Teaching

Focusing first on teaching workload, there are substantial differences in average course loads across the universities included in our study. Lakehead has the highest average workload with 5.0 courses, while Western has the lightest average workload with 2.3 courses for the fall and winter terms of the 2012 academic year. Overall, the average number of undergraduate and graduate courses taught by assistant, associate and full professors is 2.9.[36]

Figure 19: Philosophy – Average Number of Undergraduate and Graduate Courses Taught in the Fall and Winter Terms of the 2012 Academic Year



The following table presents the share of courses offered by the philosophy program that are taught by assistant, associate and full professors in our sample. The share of total courses taught in philosophy ranges from 48% to 96%. The average across undergraduate and graduate courses is 65%.

[36] From our sample of 162 faculty members, 21 taught zero courses during the fall and winter terms in 2012. These faculty members were not included when calculating the average course load per department.

Table 8: Share of Philosophy Courses Taught by Assistant, Associate and Full Professors during the Fall and Winter Terms of the 2012 Academic Year[37]

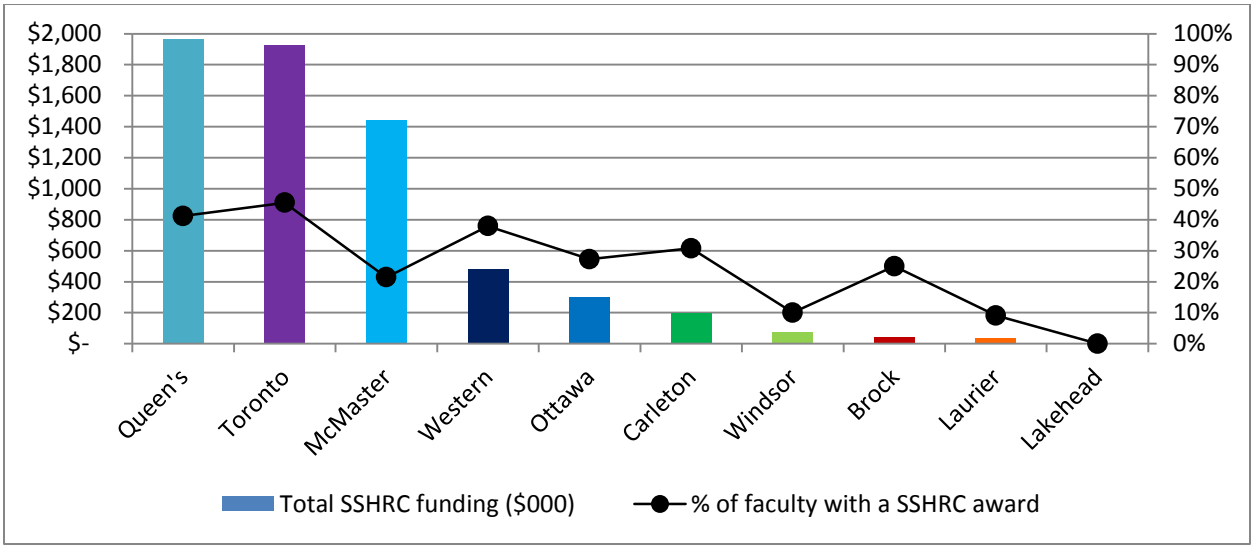
% of Philosophy courses taught by:				
	Assistant, Associate and Full Professors			Other Faculty
	Undergraduate courses	Graduate courses	All courses	All courses
Lakehead	96%	n/a[38]	96%	4%
Brock	93%	100%	94%	6%
McMaster	81%	91%	83%	18%
Windsor	67%	83%	74%	26%
Queen's	61%	67%	62%	38%
Ottawa	55%	100%	59%	41%
Western	50%	94%	57%	43%
Carleton	53%	100%	53%	47%
Laurier	43%	80%	48%	52%
Overall	**61%**	**88%**	**65%**	**35%**

C. Research

The following figure presents the aggregate SSHRC funding awarded to individual faculty members within our sample from 2007 to 2012 and the share of faculty members who held at least one SSHRC award within the same period.

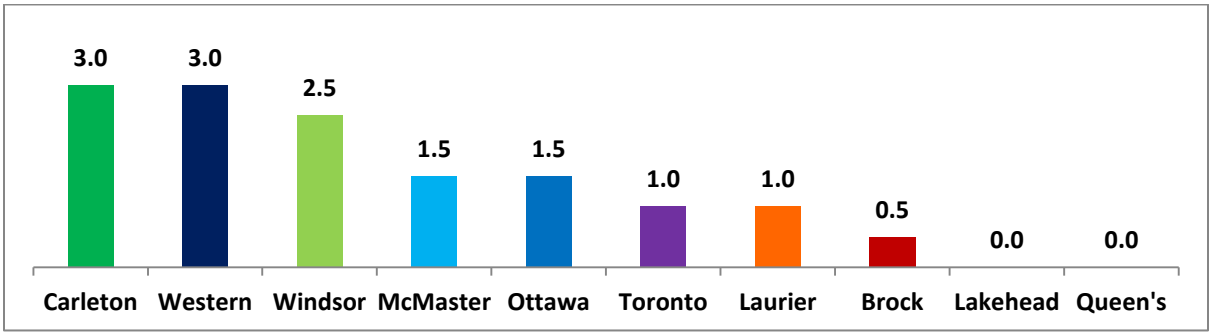
[37] We do not include Toronto in this table. Since we excluded faculty members from the Mississauga and Scarborough campuses, if these faculty members teach courses at the St George campus as well, this would not be properly reflected in the share of courses taught by assistant, associate and full professors.
[38] Lakehead does not currently offer a graduate program in philosophy.

Figure 20: Philosophy – Aggregate SSHRC Funding and the Percentage of Faculty Members who Held at least one SSHRC Award from 2007 to 2012



Capturing research volume for philosophy is more challenging as faculty members in philosophy generally publish proportionally less of their research in peer-reviewed journals. It is quite common for philosophers to publish books and book chapters. The following figure presents the median number of publications in peer-reviewed journals. Follow-up studies may wish to test the impact of also including other forms of research output.

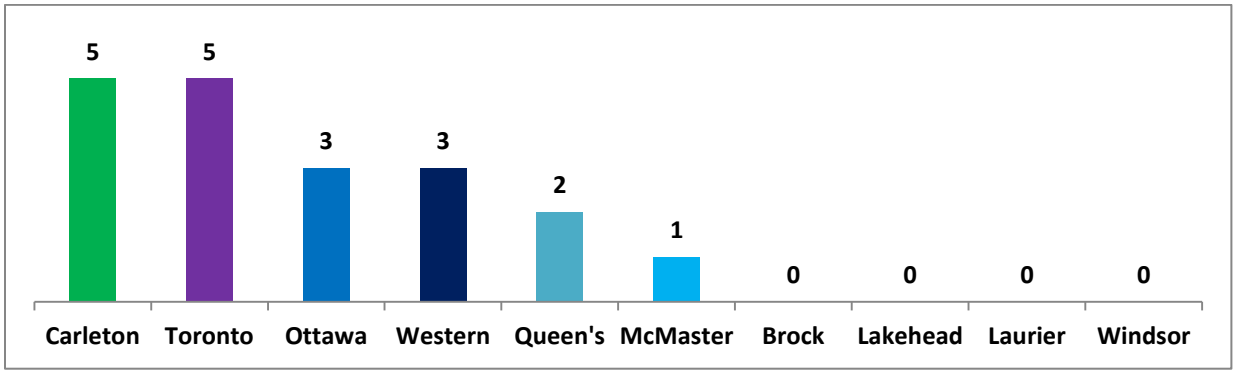
Figure 21: Philosophy – Median Number of Publications per Faculty Member from 2007 to 2012



The much lower publication volume in peer-reviewed journals resulted in low citation counts as well. We were unable to use the same citation-based methodology that we applied to economics and chemistry. Instead, we use an alternative approach to identify research impact in philosophy. We look at publication counts in the seven top philosophy journals.[39] The following figure presents the number of publications in the top philosophy journals in each department collectively from 2007 to 2012.

[39] Using rankings from the Leiter Reports: A Philosophy Blog (2013) and The Brooks Blog (2011), the top seven journals in each were classified as the top philosophy journals. While the ranking of the top seven journals was not consistent between the two

Figure 22: Philosophy – Number of Publications in the Top Philosophy Journals from 2007 to 2012



Extreme caution should be used when interpreting these observations on research impact. Measuring research volume and impact is much easier in economics and chemistry where the majority of faculty members publish in peer-reviewed or scholarly journals. Since using total citations, and even whether a publication was in a top journal, proved to be challenging in philosophy, it is hard to draw any substantial conclusions on research productivity for our philosophy sample from our approach. As a result, we do not investigate, as we did with the two other departments, where the top researchers in philosophy work. Follow-up studies may wish to explore alternate approaches to capturing representative measures of research volumes and impacts in this department.

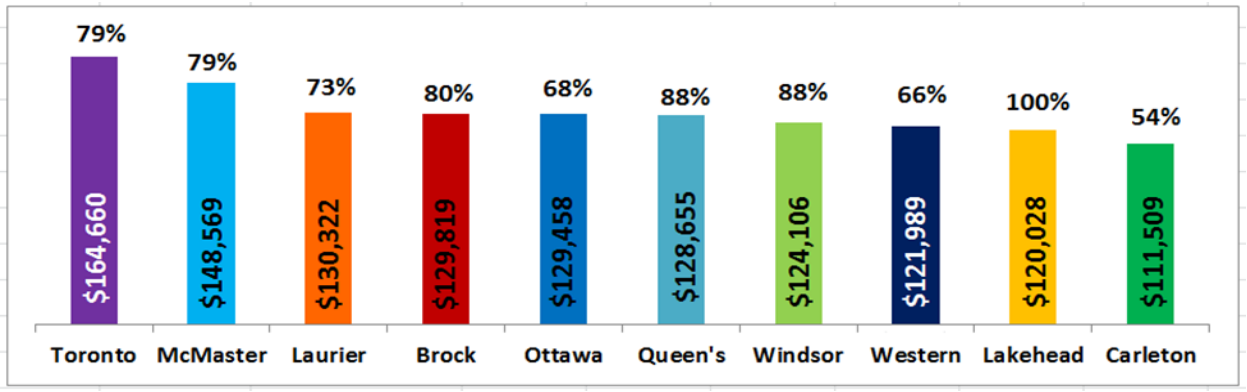
D. Salaries

Around 75% of our philosophy sample earned over $100,000 for the 2012 calendar year.[40] The following figure presents the median salary for faculty members who earned over $100,000 and the share of faculty members who were on the sunshine list. These salaries are more representative of associate and full professors, as the majority of philosophy assistant professors did not earn over $100,000.

polls, the top seven identified in The Brooks Blog poll matched the top seven identified in the Leiter Reports poll. Please see the description in the data section for more information.

[40] From the 162 faculty members in philosophy, 41 were not listed on the Ontario Ministry of Finance public disclosure list for the 2012 calendar year. The majority of these (35) are assistant and associate faculty members who likely did not earn above $100,000.

Figure 23: Philosophy – Median Salary for Faculty Members who Earned over $100,000 in 2012 and the Proportion of Faculty Members who Earned over $100,000



E. Rank

Looking at the workload patterns and earnings by rank, there do not appear to be substantial differences in the average number of courses taught or in the median number of publications in peer-reviewed journals. For earnings, the median salary is not listed for assistant professors, as the vast majority of faculty members at this rank do not earn above $100,000.[41]

Table 9: Philosophy – Workload Patterns and Earnings by Rank

	Average courses taught	Median publications	Median salary (above $100K)
Assistant	3.0	1	$ -
Associate	3.0	1	$ 120,288
Full Professor	2.8	2	$ 149,582

F. Comparison of research active and research non-active faculty

Our approach to measuring research volume through the number of articles published in peer-reviewed journals proved to be challenging for philosophy. From 2007 to 2012, 32% of faculty members in our sample did not publish in a peer-reviewed journal and 20% published only once. Our approach to measuring research volume (and research impact) may not be broadly representative of the research activity in philosophy and we refrain from classifying faculty members as research-active and research non-active.

G. Summary

The data reveal that there are differences in teaching workloads across the philosophy departments included in our study. Since our approach to measuring research activity proved to be challenging,

[41] Two out of 21 assistant professors in our sample for philosophy were on the sunshine list for 2012.

extreme caution should be used when interpreting the results relating to research volume and research impact.

Conclusion

The current analysis was designed to measure the teaching loads of faculty members in the Ontario university system and the relationship of this variable to others, such as research output and salary. Based on publicly available data, we estimate from our sample that the average teaching load of Ontario university faculty members is slightly under three courses per year (three courses per year is akin to two courses in one semester and one course in a second semester). Teaching load estimates vary by department, type of institution and rank.

The estimate of three courses per year is derived from an analysis of publicly available data in three departments – economics, chemistry and philosophy – in 10 Ontario universities. Our findings approximate the estimates of teaching loads in other analyses. For example, the four-institution pilot we published in 2012, which was developed with guidance from the Ontario Council of Academic Vice-Presidents and was aggregated from administrative data, found average teaching loads of 3.4 courses per year overall for the participating institutions.

The rationale for analysing teaching loads was to inform the discussion about opportunities for greater differentiation and productivity in the Ontario university system. The implications of the teaching load data to these larger system issues are considered in turn.

Differentiation: The Ontario government has adopted greater institutional differentiation as the major policy lever it will use to reform its postsecondary system. From the variables the government has disseminated to measure differentiation, an institution's degree of engagement with research will be one relevant dimension.

The data presented in this paper suggest that although all Ontario universities present themselves as research-intensive and typically subscribe to the 40/40/20 model of faculty deployment, they appear to be differentiated with respect to faculty workload expectations. Specifically, faculty members in those universities that are the most research-intensive – that have the greatest success (measured in research funding), output (measured as publications) and impact (measured as citations) in research – tend to teach the least. Faculty members in universities that are less engaged in research tend to teach more.

There are several possible interpretations of this relationship, including the argument that if some faculty members taught less, they might demonstrate greater research output. Similarly, institutions may differ in their willingness to allow full-time faculty members to trade off research and teaching obligations. This aspect of differentiation – different teaching expectations among tenure and tenure-track faculty – is not typically included in discussions of institutional differentiation.

Productivity: The data most germane to the productivity discussion are the relative teaching loads of faculty members who are activity engaged in research versus those who are not. Since the typical full-time faculty member is employed with an expected workload distribution of 40% teaching, 40% research and 20% service/administrative/professional duties, one might expect faculty members who are not active in research to demonstrate a compensatory additional contribution to teaching. In theory, given

the typical distribution of effort, faculty members who are not active in research might be expected to teach double the load of research-active faculty.

On the basis of the faculty members sampled in this study, and using our lowest estimates of research non-activity, we estimate that approximately 19% of tenure and tenure-track economics and chemistry faculty members demonstrate no obvious recent contribution of scholarly or research output. This estimate is lower than the 30% of faculty members suggested by the Ontario Council of Academic Vice Presidents' pilot study in four Ontario universities. Our estimate is also consistent with the analysis of H-indices of Ontario university faculty members, which shows that approximately 16% of university faculty members in Ontario have H-indices of zero, indicating either that they have never published or that their work has never been cited.

From these data, we can illustrate the productivity gains that could accrue to the Ontario university system if faculty members not active in research compensated by teaching double the load of research-active faculty. Extrapolating from our sample, we estimate that this would result in an increase of approximately 10% in the aggregate teaching capacity of the assistant, associate and full professor cohort. This estimate takes into account the data presented in this paper that faculty members not active in research are already teaching approximately 33% more than their research-active colleagues and uses the assumption that 15% of Ontario faculty members are currently not active in research.

Given the size of the full-time faculty cohort in the Ontario university system, and given the teaching loads presented in this paper, this is akin to adding a teaching contribution of 1,500 faculty members in the Ontario system. Details of the calculation are provided in Appendix 1.

We end this analysis by repeating two points we made earlier in this paper. First, the work and accomplishments of the full-time faculty professoriate are central and fundamental to the capacity, accomplishments, reputation and quality of individual institutions and the overall postsecondary system. The more we understand about how faculty members discharge the obligations expected of them, the more we can do to create conditions and practices that permit faculty members to do their best work and for institutions and systems to operate at the most effective levels.

Second, we encourage efforts to provide a more complete characterisation of the workload of Ontario faculty members. Such an analysis requires administrative data from the institutions themselves. We believe that collection and analysis of these more comprehensive data sets will provide greater and deeper insights into how the capacity of Ontario's postsecondary system could be enhanced. This challenge is not unique to Ontario. Rather, there is great benefit to obtaining similar data from other relevant jurisdictions to suggest best practices and to place the Ontario situation in context.

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Appendix 1 – Impact of Adjusting Teaching Loads for Research non-Active Faculty

Q: If non-research-active full-time faculty were to increase their teaching course loads from 1⅓ that of research-active faculty to 2 times that of research active faculty, how much more teaching could be accommodated? And what is that increase expressed as the equivalent number of additional faculty members?

A: We want to know the ratio V_2/V_1, where V_1 is the total teaching capacity of full-time faculty (research active + non-active) today, and V_2 is the total teaching capacity of the same faculty if we increase the teaching loads of non-active faculty from 1⅓ active to 2 times active.

So let T_a be the course load of research active faculty and let T_n be the course load of non-research active.

We estimate that 85% of teaching is done by research active and 15% of teaching is done by non-active. We also know that for V_1, $T_n = (T_a)(1.33)$, so that:

$V_1 = (.85)(T_a) + (.15)(T_n) = (.85)(T_a) + (.15)(T_a)(1.33)$

And after we have increased the course loads of non-active faculty to two times active, such that $T_n = (T_a)(2)$, we can also generate this equation for V_2:

$V_2 = (.85)(T_a) + (.15)(T_n) = (.85)(T_a) + (.15)(T_a)(2)$

So now we just solve the ratio V_2/V_1:

$$\frac{V_2}{V_1} = \frac{(.85)(T_a) + (.15)(T_a)(2)}{(.85)(T_a) + (.15)(T_a)(1.33)} = \frac{(.85)(T_a) + (.3)(T_a)}{(.85)(T_a) + (.2)(T_a)} = \frac{(1.15)(T_a)}{(1.05)(T_a)} = \frac{1.15}{1.05} = 1.095$$

So $V_2 = (V_1)(1.095)$, or a 10% (rounded) increase

Translating this into a corresponding number of faculty members, we can estimate that total full-time faculty in the system is about 16,000 (grossing up 2010-2011 UCASS data to 2013-2014 by assuming 2% growth each year). (16,000)(1.095) suggests an equivalency of 1,520 additional faculty members (assuming the same 85%/15% mix of research active and research non-active. Technically this too could be discounted by 10% to about 1,400, given that the new hires are assumed to be teaching at the V_2 rate.)

Appendix 2 – Summary of Findings

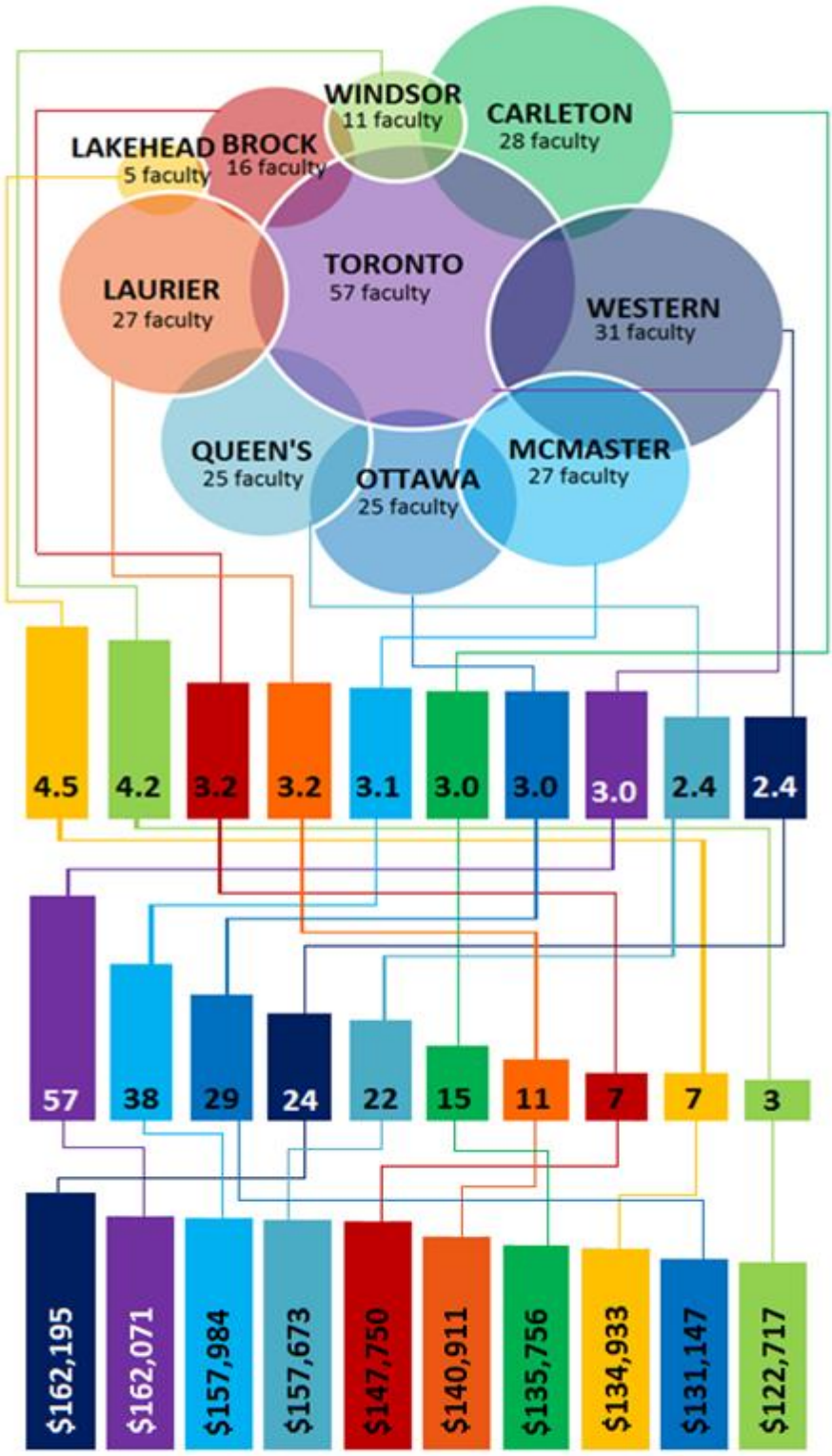
Economics

Departmental size

Average number of courses taught

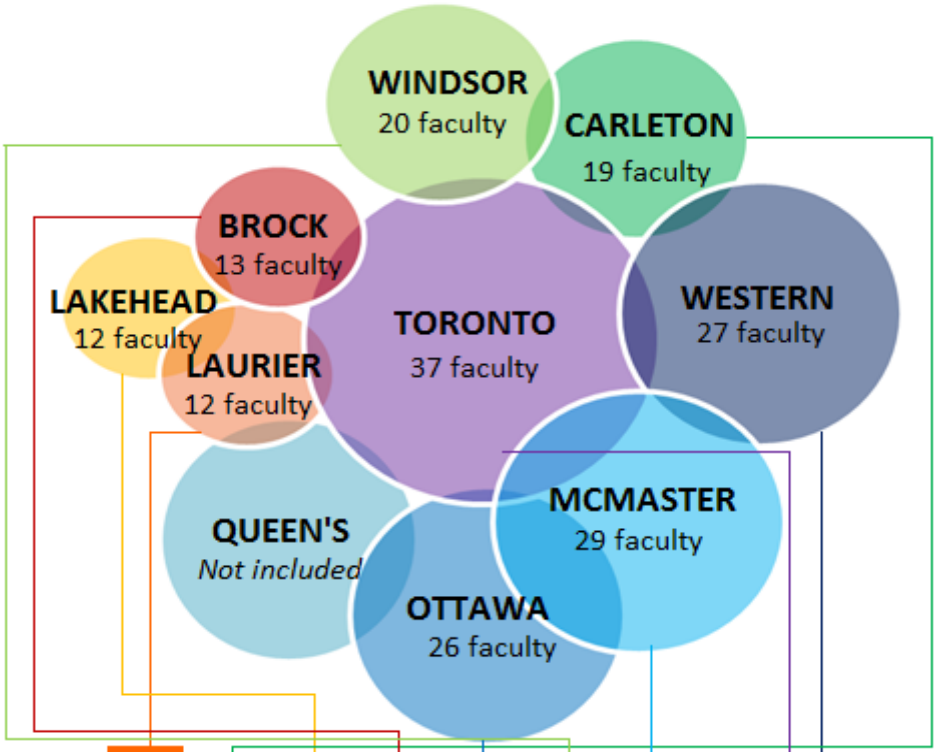
Median number of total citations per faculty member

Median salary (>$100,000)



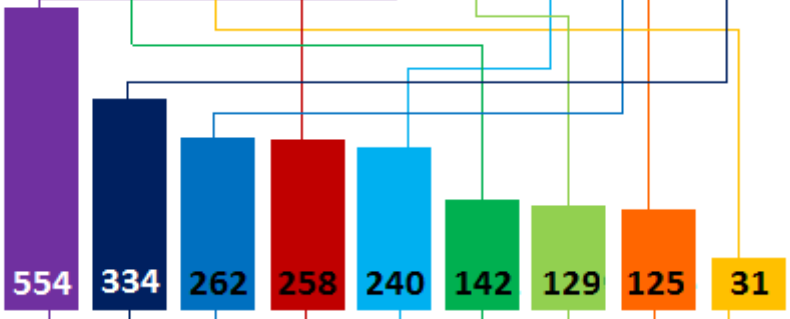
Chemistry

Departmental size



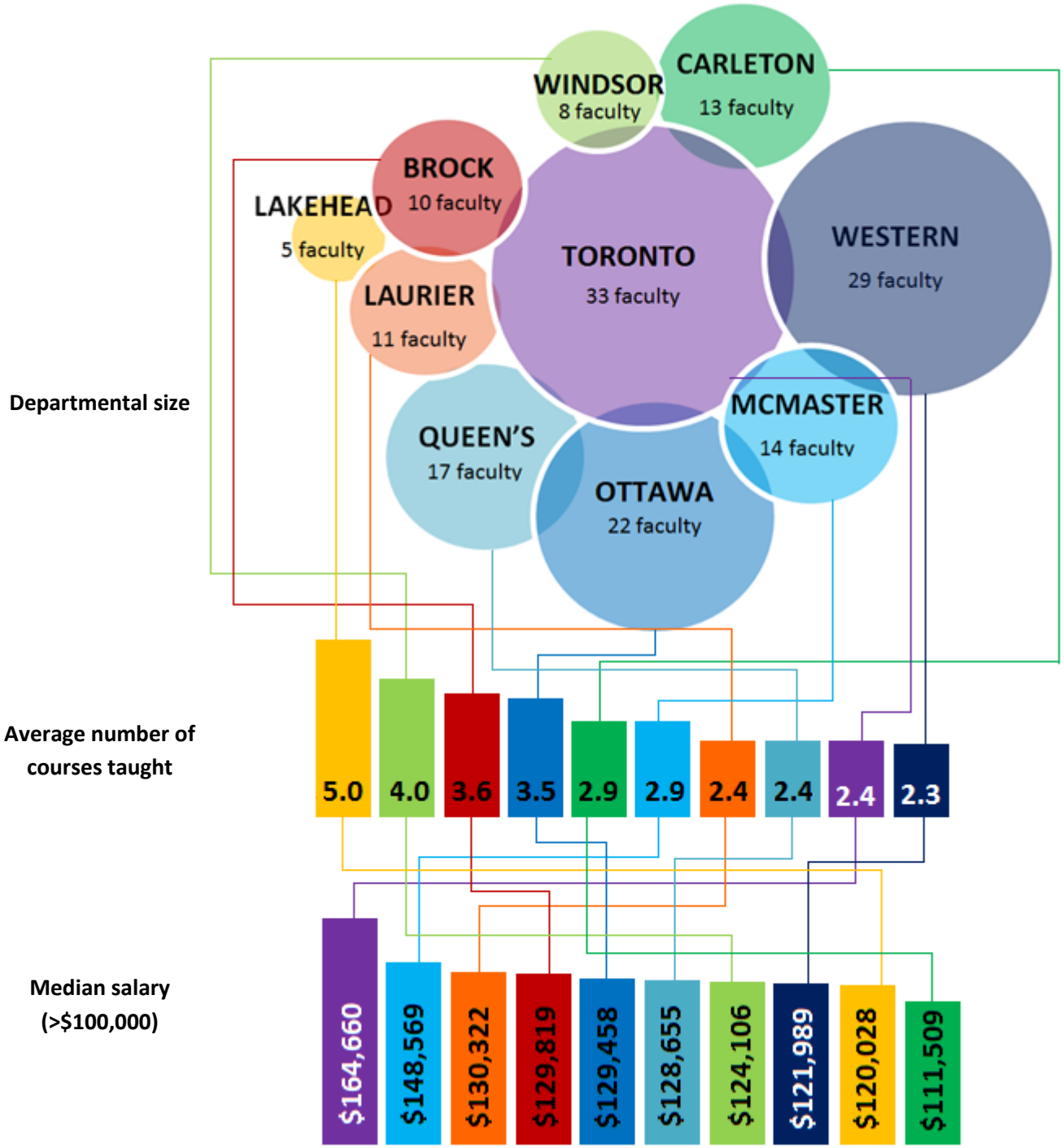
Average number of courses taught

Median number of total citations per faculty member



Median salary (>$100,000)

Philosophy


Departmental size
WINDSOR
8 faculty
CARLETON
13 faculty
BROCK
10 faculty
LAKEHEAD
5 faculty
TORONTO
33 faculty
WESTERN
29 faculty
LAURIER
11 faculty
MCMASTER
14 faculty
QUEEN'S
17 faculty
OTTAWA
22 faculty
Average number of courses taught
5.0
4.0
3.6
3.5
2.9
2.9
2.4
2.4
2.4
2.3
Median salary (>$100,000)
$164,660
$148,569
$130,322
$129,819
$129,458
$128,655
$124,106
$121,989
$120,028
$111,509