

ACADEMIC WORK AND INSTITUTIONAL DIVERSITY IN CANADA

OLIVIER BÉGIN-CAOQUETTE, SÉBASTIEN BÉLAND *Université de Montréal*

GRACE KARRAM STEPHENSON, GLEN A. JONES *University of Toronto*

AMY SCOTT METCALFE *University of British Columbia*

ABSTRACT. The objective of this article is to determine if the work of full-time professors in Canada varies depending on the type of universities in which they are employed. A nonparametric comparison of multivariate samples based on data from the *Academic Profession in the Knowledge Society* (APIKS) survey was used to examine faculty perceptions of their academic work. The results show statistically significant, albeit minimal, differences between primarily undergraduate, comprehensive, and research-intensive institutions. This article confirms that, to a small extent, institutional diversity in Canada is mirrored in academic work, and argues that both vertical and horizontal forms of diversity may exist simultaneously depending on the relative value granted to specific academic activities.

TRAVAIL UNIVERSITAIRE ET DIVERSITÉ INSTITUTIONNELLE AU CANADA

RÉSUMÉ. L'objectif de cet article est de vérifier si, au Canada, le travail universitaire varie selon le type d'université dans laquelle les professeurs travaillent. En s'appuyant sur les perspectives des professeurs quant à leur travail, des tests de comparaisons non paramétriques d'échantillons multivariés ont révélé des différences statistiquement significatives, mais de faible ampleur, entre les universités de premier cycle, les universités polyvalentes et celles à forte intensité de recherche. Cet article, qui est basé sur les données du questionnaire *La profession universitaire dans la société du savoir* (APIKS), confirme que la diversité institutionnelle au Canada se reflète dans le travail universitaire et soutient que les diversités horizontales et verticales existent simultanément en fonction de la valeur accordée à certaines activités universitaires.

Societal demands on higher education are becoming more complex, requiring institutions with specialized knowledge and programs. Scholars and policy actors call for a distinction between research-intensive universities, teaching-focused universities, community colleges, and

technical institutes (Fallis, 2013; van Vught, 2009). In Canada, however, the public university sector has no official federal policy supporting differentiation within the category of “university.” This lack of government policy differentiating universities is noteworthy and has led professional associations and media outlets to develop their own categories delineating university types. These groupings, however, are rarely the product of empirical studies and raise the question of how closely they reflect actual differences. Using data on academic work and perceptions of professors across Canada, collected in the *Academic Profession in the Knowledge Society* (APIKS) survey, this study is the first to verify if, and to what extent, academic work, as perceived by professors themselves, varies significantly between the type of institution at which they are employed.

INSTITUTIONAL DIVERSITY IN CANADA

The period immediately following the Second World War was a time of significant isomorphism among Canadian universities (Codling & Meek, 2006) during which most institutions formalized their triadic mandate of teaching, research, and service. All offered undergraduate programming and most aspired to expand their research output and graduate offerings (Milian et al., 2016). By the 1970’s a distinguishable “Canadian” model of the university across provinces had appeared, despite no coordination by the federal government (Jones, 2018). This convergence can be attributed to massification, geographic distance between institutions, and unionization. Massification occurred in the aftermath of the Second World War as veterans returned home and received financial support to attend university. The growth in enrolment was facilitated by establishing new secular universities as well as a separate sector of technical colleges. The presence of the latter, a non-university sector, not surprisingly, served to form an institutional identity among universities (Codling & Meek, 2006). Geographically, in the 1960’s, most Canadian cities housed one university at which the eligible students from the surrounding region enrolled. The distance between Canadian cities made it unlikely for students to commute for university and this required most universities to be comprehensive institutions with a wide range of undergraduate programs and growing graduate programs (Jones, 1998). This contributed to programmatic and reputational convergence as universities across Canada were seen to offer comparable programs of like quality (Jones, 2018).

Universities also mimicked each other in the hiring of faculty. Throughout the 1970’s and 1980’s many faculty associations unionized, or faculty joined broader public unions that codified their work. While specific

contracts differed between institutions based on unique collective agreements, there were overarching similarities, such as the expectation for teaching, research, and service (Jones, 2018). Umbrella organizations were formed to network union activities, and these contributed to further convergence through the sharing of best practices in academic hiring and employment (Jones et al., 2014).

When compared internationally, Canada's lack of diversity between universities and within academic work has been a point of identification (Codling & Meek, 2006). However, since 1995 financial challenges, the increased demand for degrees, and the pressures of the knowledge society to produce research, have started a gradual process of differentiation among Canadian universities (Jones, 2018). Research-intensive universities developed exclusive international partnerships with highly ranked institutions while other institutions, such as a group of four smaller universities in the Maritime provinces, formed the Maple League to highlight their small campus, student-oriented approach (MacDonald, 2016). This gradual trend toward differentiation is being further formalized in some provinces by a policy context that advocates for orchestrated system diversity. British Columbia and Alberta have been leaders in developing system diversity, articulating distinct roles for diverse institutions, and relatively smooth transfer pathways between them. In contrast, Ontario's government has merely recommended differentiation, citing it as the solution to the quality challenge and growing enrolment (Milian et al., 2016). At present there is, however, little research to determine how university differentiation across Canada is reflected in academic work.

CONCEPTUAL FRAMEWORK

Institutional diversity and academic work

The concept of diversity is widely used in the educational sciences. Traditionally, and as defined by Banks (2012), "Diversity is both an unalterable state and a social and ecological value that, if acknowledged and addressed, promotes inclusion of individuals and cultures" (p. 1886). In sociology of science, however, diversity refers to the variety of organizations (van Vught, 2009). Some authors or organizations have suggested links between the diversity of organizations and individuals. The Ministry of Training, Colleges and Universities (2013) suggests that a variety of establishments responds more adequately to the needs of a diversified clientele. Milian et al. (2016), for their part, suggest that the inequities and stratification that arise from diversity keep students in their

social classes. The two concepts are nonetheless distinct, and this article focuses on *diversity* as a static concept referring the state of the variety of institutions at a specific point in time. Along the same line, *differentiation* speaks to the dynamic process where, over time, there is a *divergence* of institutional mandates and types. *Convergence* is when institutions become more similar, also referred to as *institutional isomorphism*. Second, scholars have pointed to different forms of diversity. *Systemic* or *external diversity* is the difference between institutions, while *internal diversity* points to the differences within an institution. Furthermore, Teichler (2011) distinguishes *vertical diversity* (based on the perceived performance or reputation) from *horizontal diversity* (based on different mandates, profiles, or programs). Cantwell et al. (2018) argue that, in some systems, vertical diversity takes the form of bifurcation, which is a binary division of an “artisanal” prestigious sub-sector and a “demand-absorbing” sub-sector providing accessible educational opportunities. Third, Birnbaum (1983) presented seven sub-categories that can be used to analyze external diversity: systematic, structural, programmatic, procedural, reputational, constituential, and values or climate.

The multiple forces differentiating higher education institutions also intersect with the transformation of the academic profession (Kwiek, 2018). Shin and Jang (2013) explained that, among the policy initiatives developed to support world-class universities, vertical differentiation (through funding concentration or incentive systems) has transformed faculty hiring, work, and working environment. In Germany, Kehm (2013) reported the Excellence Initiative strengthened top-down leadership, changed the portfolio of disciplines, and increased the number of precarious research positions. In Korea, Shin and Jang (2013) explained that research funding and governance reforms encouraged international faculty hiring and the recognition of internationally distinguished performance. Locke (2011) noted rankings also impacted academic work by transforming universities’ relationships with external constituencies, such as prospective students, employers, governments, and funding agencies.

In Canada, a small body of research has emerged examining the differences in academic work in relation to institutional differentiation. The 2007 *Changing Academic Profession* (CAP) survey (Metcalf et al., 2011) revealed a greater proportion of faculty members in primarily undergraduate universities felt they were somewhat or very influential in key academic decisions compared to their counterparts in comprehensive universities, who felt they were more influential than faculty in medical/doctoral universities. Faculty in comprehensive universities

were less likely to perceive top-down management than in the two other categories. Metcalfe et al. (2016) also reported a larger proportion of academics working in medical / doctoral institutions had a stronger interest in research over teaching compared to their counterparts in other universities. In Ontario, Higher Education Quality Council of Ontario (2012) observed, on average, faculty who were active in research (measured by grants or publications) taught almost one course less than those who were not. Polster (2015) noted growing pressures on faculty at some institutions to pursue external funding, and Ross et al. (2019) suggested a reinforcement of hierarchies between institutions and between permanent / contract faculty, and between teaching-only and other faculty. Research by Vajoczki et al. (2011) described the teaching-stream positions that have been established as universities move toward expanding their internal diversity, and postulated this diversity was mirrored in academic work; however, little empirical research exists to confirm this relationship.

Categorizing Canadian universities

In Canada, categorizing universities is a challenge because most categories were created by private organizations and do not reflect legal provisions. Canada's most well-known typology is the one developed by *Maclean's* (2019), a Canadian news magazine. To rank comparable institutions, *Maclean's* distinguishes universities based on their size, the proportion of graduate students, the range of programs, and levels of research production. In its original intent, "universities in the three categories are treated as separate but equal" (Page, 1996, p. 31). Thus, the *Maclean's* typology is an example of a horizontal conception of diversity, focusing on differences in institutional mandates and programs (Teichler, 2011). The resulting three types of universities in *Maclean's* typology are: *primarily undergraduate* (focused on undergraduate education), *comprehensive* (conducting a significant amount of research with a wide range of graduate and undergraduate programs), and *medical / doctoral* (larger and research-intensive universities with a large proportion of graduate students). Universities within each type are ranked based on 14 performance indicators related to five categories: students (awards, access to professors, and satisfaction); faculty (awards, research grants, publications, and citations), resources (budget, research funding, and library services); student support (budget spent on student services, scholarship, and bursaries), and reputation (based on a reputational survey).

This typology, however, presents methodological and representativeness limitations. First, Page (2001) reported the indicators did not correlate

with one another and there were statistically significant differences within each type. Second, the typology is ill-adapted to the Quebec higher education system (HES) since most of the universities in the Université du Québec network do not appear in any category. Moreover, two specialized graduate institutions (the National School of Public Administration and the National Institute for Scientific Research), two engineering schools (École de technologie supérieure and École Polytechnique) and one business school (École des hautes études commerciales) do not fit *Maclean's* categories. Despite those limitations, the typology remains widely used in Canada, both in public discourse and empirical studies. Orton (2003) suggested expanding the *Maclean's* typology by including First Nations and Métis institutions and special-purpose organizations. Piché's (2015) study used this expanded version for a hierarchical cluster analysis. He found Ontario's university sector decreased in systemic diversity between 1994 and 2010, and universities were increasingly characterized as either undergraduate or research-intensive. Furthermore, the University of Toronto was a cluster of its own. Metcalfe et al. (2016) relied on *Maclean's* typology to compare academic experiences; but to date, no study has verified if and to what extent academic work, as perceived by professors themselves, varies significantly between medical / doctoral, comprehensive, and primarily undergraduate institutions.

While the *Maclean's* categories are descriptive, a different perspective on diversity emerged in 1991 when the 10 Canadian universities with the largest research funding formed a group. This organization gradually expanded to become the U15 in 2011 and currently includes institutions in each region (Jones et al., 2014). The U15 (2020) claims its members undertake 80% of all competitive university research funding in Canada and award more than 70% of all doctorates. ReSearch Infosource Inc. (2018) produces the annual report on *Canada's Top 50 Research Universities* and, in 2018, confirmed that the U15 formed the 15 highest-ranked institutions in Canada. As an organization, the U15 highlights vertical differentiation within the Canadian higher education and argues for a concentration of funding in its members who form "the top of the pyramid" [author translation] (Lacroix & Maheu, 2015, p. 171).

In their studies of research-intensive universities in Canada, France, the United Kingdom and the United States, Lacroix and Maheu (2015) divided universities into three categories. At the top of the hierarchy are 15 "multiversities" that offer a broad range of programs at all levels and in all disciplines, often including medical schools. This group includes the universities that have the largest research output (often in the natural and health sciences) and consequently make it into the top tier of global

university rankings. It is worth mentioning, notwithstanding two exceptions, the U15 “multiversities” are the same found in the *Maclean’s* category, medical / doctoral. Without testing for significant differences, Lacroix and Maheu (2015) found it irrelevant to use both typologies simultaneously. Following this logic, the middle of the hierarchy would be occupied by comprehensive universities that do not have a medical school but have a large research output and programs of study for all cycles and in all disciplines, including a diversity of professional programs. At the base of the hierarchy are what they call “other universities”, but are primarily undergraduate institutions.

To study how institutional diversity is mirrored in academic work, one needs to identify a set of variables linking the two phenomena. The four constructs developed by Lacroix and Maheu (2015) provide exploratory avenues. First, the U15’s distinctive features would relate to research activities and publications: their faculty would conduct the bulk of fundamental research in the country, obtain most of the federal grants, but also benefit from large private funding and donations. The second distinctive feature relates to teaching and student populations. The U15 account for half of the undergraduate student population, but also for 55% of master’s level students and 68% of the doctoral students. Those institutions would generally include a school of graduate studies and a long tradition of higher admission standards. The third feature relates to governance. Lacroix and Maheu (2015) suggest that “multiversities” benefit from larger institutional autonomy and that, although constrained by local unions and associations, their administrators’ right to manage is extensive. They also note that leaders at “multiversities” are often visionary and innovative, and their managers and professionals are highly qualified as well as high achieving. A fourth set of distinctive characteristics relate to internationalization. These universities have a clear international strategy, recruit professors from abroad, and attract a greater proportion of international graduate students. Multiple authors have used similar constructs relating to research funds and performance, graduate students, governance, and international outreach to characterize “world-class universities” in other jurisdictions (Aghion et al., 2009; Cantwell et al., 2018; Kwiek, 2018; Salmi, 2009).

Research questions

At this stage, the literature suggests different types of universities provide faculty with different working environments in terms of research, student population, governance, and internationalization, but no study has tested if academic work in Canada reflects the suggested differences. Drawing on

data of faculty's own perception regarding their work and working environment, this article aims at answering two research questions:

1. Are there significant differences in professors' academic work and perceptions of working environment between the type of university at which they are employed?
2. If so, for which variables is there a significant difference between university types?

METHODOLOGY

Participants

This article presents findings from the Canadian segment of APIKS study. Data were collected between October 2017 and June 2018. Invitation emails were sent to 45,437 academics in 64 (of the 68) publicly funded universities, 31,728 of whom were later determined to be eligible to complete the survey according to the study criteria. Data were collected in both French ($n = 725$) and English ($n = 2243$). A total of 2,968 surveys were valid, for a response rate of 9.4% (see Table 1).

Administering a long online survey contributed to a modest response rate (Fan & Yan, 2010), but the valid responses are representative of the larger population of Canadian faculty as reported by Statistics Canada (University and College Academic Staff System, 2018). In the samples, 49% of the participants identified as male, 51% as female; 16% were assistant professors, 37% were associate professors, and 41% full professors. The survey did not ask for participants' ethnicity, but 89% of the sample reported holding a Canadian citizenship.

A Chi Square Goodness of Fit test (Chi, 2) was performed in relation to four areas, and it indicated the difference was not significant ($0.3 < p < 0.7$) for age, rank, nor discipline, but was significant for gender. Even if the sample does not appear to be significantly different from the population, the fact remains that a sample of this size limits the generalization of the results to all faculty members in Canada and should prompt the reader to be cautious.

As shown in Table 1, the 64 universities surveyed were categorized into four categories that reflect the U15 and *Maclean's* categories, except for the University of Waterloo and the Université de Sherbrooke. Waterloo is categorized as "comprehensive" in the *Maclean's* ranking although it is a member of the U15 and, conversely, the Université de Sherbrooke, which is not a member of the U15, but is part of the medical / doctoral type in *Maclean's*. Four of the 64 sampled institutions were not part of the U15

nor categorized by the *Maclean's*. Those “specialized” institutions generally offer programs at all levels but in a very limited number of disciplines. The 61 respondents from those four institutions, as well as those who did not indicate their institution, were not included in our statistical analyses. The sample for the analyses therefore consists of 2,851 respondents.

TABLE I. Percentage of valid surveys by institutional type

University Type	Institutions		Faculty	
	(#)	(%)	(#)	(%)
Comprehensive	16	25%	738	25%
Primarily Undergraduate	29	45%	593	20%
Research-intensive	15	23%	1520	51%
Specialized	4	6%	61	2%
Unknown	-	-	56	2%
Total	64	100%	2968	100

Instrument

The survey included eight sections, 52 questions, and resulted in a database of 385 variables. Following the implicit conceptualization behind *Maclean's* original typology and the explicit conceptualization provided by Lacroix and Maheu (2015), we selected 20 variables related to four constructs: research activities and publications, teaching activities and student populations, perception of governance, and perception internationalization (see Table 3).

Analyses

The first analysis aimed to examine whether, given the 20 variables selected, the *Maclean's* and that of U15 typologies produced similar results. Nonparametric comparisons of multivariate samples were produced using approximations for ANOVA Type, Wilks' Lambda, Lawley Hotelling and Bartlett Nanda Pillai Test statistics with 500 permutations, and the findings for the two typologies. R package *npmv* (Burchett et al., 2017) was used to approximate these methods. Post-hoc tests were computed in R to assess group differences for each of the 20 variables under investigation. First, Fisher's exact tests with multiple comparisons were used to locate differences in discrete variables and the Cramer V was used to quantify the effect size. Second, continuous variables were analyzed using the Kruskal-Wallis test and the Dunn's test of multiple comparisons using rank sums (Dinno, 2017). The effect size was reported using the η^2 .

Limitations

This study presents important limitations, one of which relates to the sample size, which limits the generalizability of the findings. In addition, although the variables extracted from the questionnaire directly stem from the conceptual framework, some of them relate to the academic work while others relate professors' perception of their working environment. The latter should be interpreted with caution since the relationship between a working environment and its perception might not be direct. This study solely focuses on the work of university professors; however, some of the tasks associated with institutional diversity could be undertaken by other types of actors, such as lecturers and research professionals.

FINDINGS

Are there significant differences in academic work between university types?

The objective of this paper is to verify if, in Canada, faculty work and faculty's perception of their working environment vary depending on the type of university. As shown in Table 2, the non-parametric MANOVA reveals academic work varies depending on the type of university in which they work. The Lawley Hotelling type (McKeon's F approximation) statistic test revealed the global hypothesis of equality between groups was rejected at a significant level. Subset algorithms based on factor levels revealed the hypothesis of equality was rejected for all groups. All appropriate subsets using factor levels have been checked using a closed multiple testing procedure, which controls the maximum overall type I error rate at $\alpha=0.05$. What the MANOVA also reveals is both the *Maclean's* original typology and the U-15 typology produce almost identical results. Thus, to lighten the text, we will only present the findings based on the original *Maclean's* typology, and we will refer to medical / doctoral universities as "research intensive."

TABLE 2. *Nonparametric MANOVA with permutations (Nb. Permutations = 500)*

Effect	<i>Maclean's</i> original typology				U15/ <i>Maclean's</i> typology			
	Test Statistic	df1	df2	Perm . P-value	Test Statistic	Df1	Df2	Perm . P-value
ANOVA type test p-value	6.54	23.5 3	3628.2 6	0.00	6.67	23.5 4	3826.4 0	0.00

McKeon approx. for the Lawley Hotelling	3.38	40.00	652.59	0.00	3.06	40.00	652.59	0.00
Muller approx. for the Bartlett-Nanda-Pillai Test	3.37	40.31	725.70	0.00	3.02	40.31	725.70	0.00
Wilks' Lambda	3.38	40.00	720.00	0.00	3.04	40.00	720.00	0.00

Table 3 compares average responses to the selected 20 variables based on the type of institution in which respondents work. The distribution of work at research-intensive universities aligns with professors' strong preference for research over other activities. Professors in research-intensive universities are more likely to dedicate a larger proportion of their time to research, prefer research to other activities, characterize their research as basic / theoretical, produced more scholarly contributions, including more journal articles, and receive a larger proportion of their research funding from national research funding agencies or industry. With regards to teaching activities, faculty in research-intensive institutions report spending a smaller proportion of their teaching in bachelor's programs, the same proportion as their counterparts in comprehensive institutions teaching in master's programs, and a greater proportion of their time teaching in doctoral programs. Faculty in primarily undergraduate institutions, however, are slightly more likely to work in institutions that set quantitative load targets for the number of master's and doctoral students for supervision.

TABLE 3. Means and standard deviations for 20 survey items (n = 2851)

Variables	Average (s.d.)	Maclean's original typology		
		Med/Doc	Comp	Undergrad
<i>Research activities and publications</i>				
B1_AB2 Proportion of hours per week dedicated to research when classes are in and not in session (%)	0.40 (0.19)	0.42 (0.19)	0.40 (0.18)	0.35 (0.18)
B2 Regarding your own preferences, do your interests lie primarily in teaching or in	2.73 (0.85)	2.84 (0.86)	2.74 (0.81)	2.45 (0.88)

research? (1-5; 5 = primarily in research)				
D2_1 How would you characterize the emphasis of your primary research? - Basic/theoretical (1-5; 5 = very much so)	3.42 (1.32)	3.50 (1.31)	3.31 (1.32)	3.42 (1.34)
D2_3 How would you characterize the emphasis of your primary research? - Commercially-oriented/intended for technology transfer (1-5; 5 = very much so)	1.70 (1.12)	1.67 (1.09)	1.69 (1.15)	1.73 (1.16)
D3_4 How many of the following scholarly contributions have you completed in the past 3 years? - Articles published in an academic journal (number of articles)	8.14 (10.61)	9.54 (11.84)	7.42 (8.88)	5.44 (8.86)
D3_SUM How many of the following scholarly contributions have you completed in the past 3 years? - Sum of all scholarly contributions (number of scholarly contributions)	24.82 (26.23)	26.81 (26.83)	24.92 (25.23)	18.62 (23.63)
D6_2_A Proportion of funding coming from national research funding agencies (%)	33.53 (38.07)	37.05 (38.80)	35.27 (37.76)	21.24 (34.86)
D6_4 Proportion of the funding from business firms or industry? (%)	3.26 (12.11)	3.48 (12.41)	3.10 (11.87)	1.96 (9.78)
<i>Teaching activities and student population</i>				
C1_1 Proportion of your teaching related activities you conduct for teaching leading to bachelor's degree or equivalent (%)	58.73 (34.41)	51.01 (34.11)	57.17 (31.83)	78.86 (29.90)
C1_2 Proportion of your teaching related activities you conduct for teaching leading to master's degree or equivalent (%)	21.49 (24.40)	23.27 (24.19)	24.20 (24.25)	12.27 (20.78)
C1_3 Proportion of your teaching related activities you conduct for teaching leading to doctoral students (%)	14.18 (20.26)	19.16 (22.01)	13.69 (19.16)	4.56 (13.27)
C3_3 Does your institution/unit set quantitative load targets for the number of second-degree students (master's students) for supervision? (1 = yes; 2 = no)	1.89 (0.32)	1.87 (0.34)	1.89 (0.31)	1.94 (0.24)

C3_4 Does your institution/unit set quantitative load targets for the number of third-degree students (doctoral students) for supervision? (1 = yes; 2 = no)	1.91 (0.29)	1.87 (0.34)	1.93 (0.26)	1.99 (0.11)
<i>Perception of governance</i>				
F3_1 At your institution, there is competent leadership (1-5; 5 = strongly agree)	3.07 (1.24)	3.12 (1.25)	3.13 (1.20)	2.85 (1.26)
F3_4 At your institution, there is a top-down management style (1-5; 5 = strongly agree)	3.66 (1.21)	3.76 (1.16)	3.44 (1.26)	3.74 (1.20)
F3_5 At your institution, there is collegiality in decision-making processes (1-5; 5 = strongly agree)	2.81 (1.16)	2.73 (1.14)	2.99 (1.19)	2.68 (1.17)
<i>Perception of internationalization</i>				
C4_9 Since you started teaching, the number of international students has increased (1-5; 5 = strongly agree)	3.63 (1.23)	3.72 (1.16)	3.44 (1.28)	3.70 (1.25)
C4_10 Currently, most of your graduate students are international (1-5; 5 = strongly agree)	2.45 (1.43)	2.53 (1.43)	2.35 (1.43)	2.31 (1.37)
F6_1 Your institution has a clear strategy for internationalization (1-5; 5 = strongly agree)	2.98 (1.15)	3.15 (1.14)	2.88 (1.13)	2.84 (1.17)
F6_6 Your institution encourages the recruitment of faculty members from foreign countries (1-5; 5 = strongly agree)	2.53 (1.12)	2.74 (1.14)	2.46 (1.08)	2.15 (0.97)

In governance, faculty members in research-intensive and comprehensive universities agree there is competent leadership in their institution more than their counterparts in primarily undergraduate universities. Yet faculty members in comprehensive universities agree less with the statement regarding top-down management and more with the statement regarding collegiality. Faculty members in research-intensive and comprehensive institutions perceive there are more international graduate students, a clearer international strategy, and more intentional recruitment of international faculty than counterparts in primarily undergraduate institutions.

For which variable is there a significant difference between university types?

Overall Cramer V (Fisher's exact test) and chi-squared (Kruskal-Wallis test) are significant for 18 of the 20 selected variables. The two variables that do not explain group differences are those related to the characterization of research, namely whether research activities are basic and theoretical (D2_1) or commercially oriented and intended for technology transfer (D2_3).

Fisher's exact tests were run for 12 ordinal variables. Although groups vary significantly for 10 of the 12 variables, overall Cramer's V shows weak (between 0.10 and 0.20) to very weak (under 0.10) associations between the three university types and those variables. The only variables for which there is a weak association are the preference for research (B2), the presence of quantitative target loads for doctoral supervision (C3_4), the recruitment of international faculty (F6_6). Levels of association appear stronger when only research-intensive and primarily undergraduate universities are compared. Some variables, however, reveal that differences lie mostly between comprehensive and primarily undergraduate institutions. The overall level of association between university type and top-down management (F3_4) or collegiality (F3_5) is very weak, and weak when we compare comprehensive institutions to primarily undergraduate.

TABLE 4. Comparison involving discrete variables (Maclean's original typology)

Variables	Overall		Comp. vs. Und.		Comp. vs. Med/Doc		Und. vs. Med/Doc	
	F.T.	C.V.	F.T.	C.V.	F.T.	C.V.	F.T.	C.V.
<i>Research</i>								
B2	p<.01	.13	p<.01	.17	p<.01	.09	p<.01	.21
D2_1	n.s.	.05	n.s.	.05	n.s.	.08	n.s.	.04
D2_3	n.s.	.04	n.s.	.04	n.s.	.06	n.s.	.04
<i>Student population</i>								
C3_3	p<.01	.09	p<.01	.08	p<.05	.03	p<.01	.10
C3_4	p<.01	.16	p<.01	.14	p<.01	.09	p<.01	.19
<i>Governance</i>								
F3_1	p<.01	.07	p<.01	.11	n.s.	.05	p<.01	.10
F3_4	p<.01	.09	p<.01	.13	p<.01	.14	n.s.	.05
F3_5	p<.01	.09	p<.01	.14	p<.01	.12	n.s.	.05
<i>Internationalization</i>								

C4_9	p<.01	.08	p<.01	.10	p<.01	.12	n.s.	.06
C4_10	p<.01	.09	p<.01	.12	p<.05	.08	p<.01	.13
F6_1	p<.01	.09	n.s.	.05	p<.01	.12	p<.01	.13
F6_6	p<.01	.15	p<.01	.15	p<.01	.12	p<.01	.24

C.V.: Cramer V value (0 ≤ X < 0.10 = Very Weak; 0.10 ≤ X < 0.20 = Weak; 0.20 ≤ X < 0.30 = Moderate; X ≥ 0.30 = Strong);

F.T.: adjusted p-values of a Fisher exact test based on 2000 replications;

n.s.: non-significant adjusted p-value.

Kruskall-Wallis' test was used to test for the overall difference between the three groups and the difference was significant ($p < 0.01$) for the eight continuous variables. The magnitude of the difference is, however, very small. The Eta^2 reveals the typologies explain between 0.3% (D3_SUM) and 13% (C1_3) of the variance in the dependent variables. Four variables (B1_AB2, D3_4, C1_1, C1_3) reveal differences between each pair of groups, but four other variables (D3_SUM, D6_2_A, D6_4, C1_2) reveal non-significant differences between research-intensive and comprehensive universities. Like for the ordinal variables, difference magnitudes appear slightly larger when research-intensive and primarily undergraduate institutions are compared than when comprehensive universities are compared to the others. The results suggest the typology is associated with significant differences between university types, although it only explains a small portion of total variance in professors' responses.

TABLE 5. Comparison involving continuous variables (Maclean's original typology)

Variables	Overall		Comp. vs. Und.		Comp. vs. Med/Doc		Und. vs. Med/Doc	
	K.W.	Eta ²	Dunn	Eta ²	Dunn	Eta ²	Dunn	Eta ²
<i>Research</i>								
B1_AB2	p<.01	.02	p<.01	.01	p<.01	.002	p<.01	.02
D3_4	p<.01	.04	p<.01	.01	p<.01	.01	p<.01	.04
D3_SUM	p<.01	.003	p<.01	.003	n.s.	.000	p<.01	.003
D6_2_A	p<.01	.03	p<.01	.02	n.s.	.000	p<.01	.03
D6_4	p<.01	.004	p<.01	.004	n.s.	.000	p<.01	.004
<i>Student population</i>								
C1_1	p<.01	.11	p<.01	.06	p<.01	.004	p<.01	.11

C1_2	p<.01	.06	p<.01	.05	n.s.	.000	p<.01	.05
C1_3	p<.01	.13	p<.01	.05	p<.01	.02	p<.01	.12

Dunn: adjust p-value from the Dunn's test of multiple comparisons using rank sums;

Eta²: proportion of variance in the dependent variable explained by the independent variable;

K.W.: adjusted p-value from Kruskal-Wallis test by rank; n.s.: non-significant adjust p-value.

DISCUSSION

The objective of this paper is to determine if the work of full-time professors in Canada varies depending on university type. The findings suggest that, notwithstanding the typology of universities, institutional diversity in Canada is, to a small extent, reflected in participants' academic work and perceptions of their working environment. Our findings also suggest the relationship between institutional types and academic work is partly explained by four constructs: research activities and publications, teaching activities and student populations, perception of governance, and perception internationalization.

Academic work in research-intensive universities

Previous research suggested, in Canada, there was some evidence of institutional diversity (Piché, 2015), and faculty members reported different experiences in different institutions (Metcalf et al., 2016), but his study is the first to confirm statistically significant differences in academic work between research-intensive, comprehensive, and primarily undergraduate institutions. Although the differences are small in magnitude, ten variables suggest that, *compared to their counterparts at all other universities*, professors in research-intensive universities in Canada:

1. Spend a larger proportion of their time on research activities,
2. Have a stronger preference for research than teaching,
3. Publish more scholarly articles,
4. Spend less of their teaching time with undergraduate students,
5. Spend more of their teaching time with doctoral students,
6. Are less likely to encounter quantitative target loads for master's students' supervision,
7. Are less likely to encounter quantitative target loads for doctoral students' supervision,
8. Are more likely to teach international graduate students,

9. Perceive a clearer internationalization strategy,
10. Perceive more intentional recruitment of international faculty.

This study also indicates the characteristics of research-intensive institutions are reflected in academics' professional activities and perceptions of working environment. For example, the "world-class" or "flagship" status is, to a large extent, associated with universities' research production (Cantwell et al., 2018), and, correspondingly, faculty members who work in those institutions spend more time on research and publish more scholarly articles. Similarly, while studies characterize research-intensive universities as having a larger proportion of graduate students (Aghion et al., 2009), and international students (Salmi, 2009) and faculty (Shin & Jang, 2013), our findings confirm these characteristics are reflected in professors' time with graduate and international students, and their cognizance of an international strategy and international faculty recruitment. Although research-intensive universities count more graduate students and their leadership is depicted as strategic (Lacroix & Maheu, 2015), Canadian faculty members employed by those institutions are less likely to encounter supervision targets, which could be related to the level of academic freedom enjoyed in that type of institution (Karran & Mallinson, 2019). These findings support, to a small extent, a claim that the U15 (2020) members provide academics with a different working environment.

However, one should keep in mind this distinctive character remains clearer when research-intensive universities are compared to primarily undergraduate rather than comprehensive institutions. Five variables suggest that faculty members in comprehensive institutions do not differ significantly from their counterparts in research-intensive universities in terms of scholarly contributions, teaching time to master's students, nor in terms of the proportion of their research funding coming from federal research grants. Our interpretation is that there is noteworthy intra-group variance in the "comprehensive" category (Page, 1996), with some institutions following a research capacity-building strategy and others securing their share of the student market (Cantwell et al., 2018).

The magnitude of institutional diversity

Differences and associations were significant for 18 variables, meaning the observed differences and associations are likely to reflect the characteristics of the Canadian professoriate and the possibility the findings occurred by chance is very small. However, as the American Statistical Association (Wasserstein & Lazar, 2016) explains, "Statistical significance is not

equivalent to scientific, human, or economic significance. Smaller p-values do not necessarily imply the presence of [...] more important effects” (p. 132). In other words, academic work varies between institutions, but by how much? Cramer’s V suggests weak to very weak levels of association between variables and institutional type, and the effect size (or η^2) of the differences between institutional types is small. In front of such results, this section focuses on exploring why institutional diversity explains little variance in professorial work and, consequently, what other factors should be considered.

Our findings seem to provide a more nuanced portrait than the institutionally aggregated data suggest. For instance, members of the U15 (2020) account for 80% of all competitively allocated research funding and 70% of full-time doctoral students in Canada; however, institutional types only explain 13% of the variance in the proportion of time professors spend with doctoral students, 2% of the variance of the time spent on research and 4% of variance of the numbers of published articles. As an illustration, participants from research-intensive universities reported spending 42% of their time on research and having published 9.54 scholarly articles, which is only 2% and 1.4 paper above sample’s averages (see Table 3). The implications are twofold: institutional diversity in Canada appears as a matter of volume and emphasis rather than of distinct institutions, and variations in academic work are the result of complex multilevel (individual, institutional, and systemic) interactions.

Our interpretation is in line with van Vught’s (2009) postulate that uniform environmental conditions and strong academic norms limit the effects of institutional diversity. First, geographic distance between institutions, rapid massification, and faculty unionization fostered isomorphic pressures on the development of Canadian HES (Codling & Meek, 2006), in which most universities adopted the triadic mandate of teaching, research, and service, and offered undergraduate and graduate programs (Milian et al. 2016). In addition, most provinces’ funding formulas make allocations based on undergraduate enrolment, meaning even the most research-intensive universities still need a large base of undergraduate students to function (Fallis, 2013). As Jones (2018) explained, “none of the U15 universities can be considered small, elite universities” (p. 220), and, in this sense, although Canada counts as a high-participation system, it does not adequately fit the distinction between an “artisanal” subsector and “demand-absorbing” subsector (Cantwell et al., 2018). Thus, institutional diversity appears in Canada as a matter of volume and emphasis rather than of distinct sub-sectors undertaking different work.

Second, in terms of academic norms, Skolnik (1986) had noticed that faculty, across the country, shared a professorship ethos, which could limit the effect of institutional diversity on how academics perceive their work. It is also worth noting, more than 80% of Canadian faculty are unionized, and that local unions are part of provincial and national umbrella associations, which level working conditions, standardize hiring practices and systematize expectations regarding teaching, research, and service (Jones, 2018). This would partly explain why the magnitude of diversity suggested by institutionally aggregated data is not entirely reflected in academic work as Canadian faculty in all institutional categories are engaged in similar activities, but to a different degree.

Moreover, as work is influenced by complex interactions between analytical levels above and below the institution (Porter & Umbach, 2001), part of the variance unaccounted for by the two typologies may be explained by individual and systemic factors. On the one hand, studies have showed that variables at the individual level (e.g., age, rank, gender, ethnicity) influence professors' research productivity (Kwiek, 2018), teaching experiences (Solem & Foote, 2004), or perception of the working environment (Webber & Rogers, 2018). The relative over-representation of female faculty in our sample could have influenced the findings. In sum, multilevel interactions between individual and institutional factors should be further explored, as Arimoto (2011) suggests that research-intensive universities attract and recruit faculty who possess the characteristics that allow those institutions to remain at the top.

Conversely, since education is an exclusive provincial jurisdiction in Canada, and since provincial HES vary in terms of internationalization, research production (Council of Canadian Academies, 2018), enrolment rates, language, and governance (Eastman et al., 2018), it is relevant to wonder if a specific type of institution in one province provides the same working environment as the same type of institution in another province. In sum, we contend that academic work is at the core of multilevel interactions, and although institutional differences are statistically significant, diversity stems from a much more complex system of interinfluences.

Forms of diversity in the Canadian context

The findings of this paper were almost identical when using both the Maclean's original typology and the U15 modified version. This is not surprising since these typologies only differ by two institutions. At the same time, it opens the question of which forms of diversity stem from these statistically significant, albeit very small, differences in academic

work. Using Teichler's (2011) concepts of vertical and horizontal diversity, are primarily undergraduate, comprehensive, and research-intensive universities *horizontally* different from another, as the *Maclean's* original typology based on program offering suggests (Page, 1996)? Or are they vertically different with the research-intensive occupying the top of a hierarchy (Lacroix & Maheu, 2015) based on research performance (Cantwell et al., 2018)? We suggest the same diversity, initially conceived as horizontal, is now vertical because of the unequal social value granted to different academic activities.

Cantwell et al. (2018) suggest the tendency toward vertical differentiation is magnified when students and their families compete for places in the most valuable institutions and when these institutions compete with one another and charge different tuition fees. In Canada, universities are geographically distant from one another, tuition fees are regulated by provincial governments, and as noted by Jones (2018), there is a general perception that universities were different but of equal status, at least in terms of teaching. However, van Damme (2009) explains that, "in a given social and political context each dimension of diversity can be loaded with values and preferences and, thus, get 'hierarchical' properties" (p. 48). In 1945, only five Canadian universities had the capacity to offer PhDs, and few had the expensive faculties of medicine or engineering. For some observers (Page, 1996), these differences contributed to a horizontal diversity of programs and in 1991, the oldest, largest, and most recognized universities formed a group (G10) to demand support tailored to their status. Social recognition of an elitist character at these universities was subsequently reinforced by the release of international rankings largely based on institutions' research in natural and health sciences.

Since international rankings contribute to a complexity reducing effect (Münch, 2014), where a diversity of activities is reduced to a few criteria, and since the activities in which these institutions engage meet these criteria, this group of institutions became the most visible both nationally and internationally. In other words, if a society puts a higher value on publications, graduate programs, and natural / health sciences than on teaching, undergraduate programs, or the humanities, it symbolically constructs a hierarchy out of an existing horizontal diversity. Cantwell et al. (2018) argue that universities valorized by rankings will convert this symbolic power into material gains by claiming a concentration of resources allowing them to fulfill their mission and compete globally which, in turn, might lead to system bifurcation. In Canada, there have been calls (e.g., U15, 2015) for greater recognition and concentration of public funding, and some literature does suggest funding from the

Canadian Foundation for Innovation (CFI, 2015) and the Canada (Excellence) Research Chairs Program have reinforced hierarchies (Polster, 2015; Side & Robbins, 2007).

Our findings imply that the same level of diversity can be simultaneously conceived as vertical and horizontal depending on the relative value granted to specific academic activities and the prestige they bring to institutions. When the vertical conception of this diversity becomes widely recognized by society and policymakers it can, however, increase resource asymmetry (Cantwell et al., 2018), which may in turn influence professors' working environment and support. As Neave (1996) states, "it is equally possible for apparently contradictory patterns to coexist within systems...[since] whether it is diverging, or converging is largely a function of where we focus our attention" (p. 28).

CONCLUSION

The objective of this article was to determine if the work of full-time professors in Canada and their perception of their working environment varied depending on the type of universities in which they are employed. A nonparametric comparison of multivariate samples based on a survey of university professors across Canada ($n = 2,851$) confirmed statistically significant differences, but of very small magnitude, in academic work between research-intensive, comprehensive, and primarily undergraduate universities. The implications of our findings are threefold: the relationship between institutional types and academic work is partly explained by universities' research engagement, student populations, governance, and internationalization; variations in academic work might be at the core of multilevel interactions between individual, institutional and systemic factors; and institutional diversity can be simultaneously conceived as vertical and horizontal depending on the relative value granted to specific academic activities.

One could question whether faculty's perception of their working environment is a sound proxy to assess institutional diversity; yet we believe professors are the most directly involved in teaching and research processes and therefore their perceptions constitute a critical lens to examine the authenticity of categorization. Future studies could verify if differences expand to other areas of academic work (such as work satisfaction or involvement in external activities) or conduct an exploratory analysis (such as a cluster analysis) to propose an even more empirically adequate new typology. Acknowledging the limits of p-values (Wasserstein & Lazar, 2016), another analytical strategy could be to

reproduce our analysis using a Bayesian framework. As disciplinary areas also influence academic work (Becher & Trowler, 2001), a subsequent analysis could examine the interaction between institutional type and disciplinary areas in explaining variations in academic work and faculty's perception of working environment. This study, however, represents a first step in statistically assessing *the extent of the influence* of institutional diversity on academic work.

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OLIVIER BÉGIN-CAOUCETTE is an Associate Professor in comparative higher education, as well as the coordinator for higher education programs at the Université de Montréal. He is also one of the co-founders of the Laboratory for Interdisciplinary Research on Higher Education (LIREs). His research focus on the interactions between higher education systems and their political, economic, social and cultural contexts. olivier.begin-caouette@umontreal.ca

SÉBASTIEN BÉLAND is an Associate Professor in the Department of Educational Policy and Foundations at the Université de Montréal, Canada. He is also a member of the Laboratory for Interdisciplinary Research on Higher Education (LIREs). His research is at the intersection of statistics, educational measurement, academic integrity, and classroom assessment within higher education. sebastien.beland@umontreal.ca

GRACE KARRAM STEPHENSON is an Assistant Professor in the Department of Leadership, Higher and Adult Education at the Ontario Institute for Studies in Education. Grace teaches recurring issues in higher education, comparative higher education, and teaching and learning in higher education. Her research explores the academic profession, international branch-campuses in the Arab Gulf and Southeast Asia, study abroad programs and spirituality. grace.karram@utoronto.ca

GLEN A. JONES is the Ontario Research Chair in Postsecondary Education Policy and Measurement, Professor of Higher Education and Director of the Centre for the Study of Canadian and International Education, Ontario Institute for Studies in Education, University of Toronto. His research focuses on higher education governance, policy, and academic work. glen.jones@utoronto.ca

AMY SCOTT METCALFE is a Professor of Higher Education in the Department of Educational Studies at the University of British Columbia in Vancouver, Canada. Her research focuses on higher education in Canada and the North American region, including (post)critical approaches to internationalization, academic labour and mobility, and critical policy studies in education. amy.metcalfe@ubc.ca

OLIVIER BÉGIN-CAOUILLE est professeur agrégé en enseignement supérieur comparé et responsable des programmes en enseignement supérieur à l'Université de Montréal. Il est co-fondateur du Laboratoire interdisciplinaire de recherche sur l'enseignement supérieur (LIREs) et mène des études sur les interactions entre les systèmes d'enseignement supérieur et les contextes politiques, économiques, sociaux et culturels. olivier.begin-caouette@umontreal.ca

SÉBASTIEN BÉLAND est professeur agrégé au Département d'administration et fondements de l'éducation de l'Université de Montréal, au Canada. Il est également membre du Laboratoire interdisciplinaire de recherche sur l'enseignement supérieur (LIREs). Ses recherches se situent à l'intersection des statistiques, de la mesure en éducation, de l'intégrité académique et de l'évaluation des apprentissages à l'enseignement supérieur. sebastien.beland@umontreal.ca

GRACE KARRAM STEPHENSON est professeure adjointe au Département de leadership, d'éducation supérieure et d'éducation des adultes de l'Institut d'études pédagogiques de l'Ontario. Grace enseigne les enjeux de l'enseignement supérieur, l'enseignement supérieur comparé ainsi que l'instruction et l'apprentissage dans l'enseignement supérieur. Ses recherches explorent la profession universitaire, les campus internationaux dans le Golfe arabe et en Asie du Sud-Est, de même que les programmes d'études à l'étranger et la spiritualité. grace.karram@utoronto.ca

GLEN A. JONES est titulaire de la Chaire de recherche de l'Ontario sur les politiques et la mesure de l'éducation postsecondaire, professeur en enseignement supérieur et directeur du Centre d'études sur l'enseignement supérieur canadien et international, à l'Institut d'études pédagogiques de l'Ontario, Université de Toronto. Ses recherches portent sur la gouvernance, les politiques et le travail en enseignement supérieur. glen.jones@utoronto.ca

AMY SCOTT METCALFE est professeure en enseignement supérieur au Département d'éducation de l'Université de la Colombie-Britannique à Vancouver, au Canada. Ses recherches portent sur l'enseignement supérieur au Canada et en Amérique du Nord, y compris sur les approches post-critiques de l'internationalisation, du travail et de la mobilité universitaire, ainsi que sur les études politiques critiques en matière d'éducation. amy.metcalfe@ubc.ca