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Promotion at Canadian Universities: The Intersection of Gender, Discipline, and Institution

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ABSTRACT

Statistics Canada's annual census of full-time faculty at all Canadian universities, between 1984 to 1999, is used to measure the effect of gender, discipline, and institution on promotion from assistant to associate professor and from associate to full professor. Accelerated failure time models show that gender has some effect on rates of promotion, but that disciplinary and institutional variation are much greater. Generally, departments in science, engineering, and professional schools promote their faculty more rapidly, while disciplines strongly oriented to training practitioners are slowest. There is considerable variation among institutions, but this is not strongly linked to institutional characteristics such as size and prestige. All these factors more strongly affect the length of time for promotion from associate to full professor, than for promotion from assistant to associate professor.

RÉSUMÉ

Nous utilisons le recensement annuel des professeures et professeurs à temps plein des universités canadiennes de Statistiques Canada (1984 à 1999) afin de mesurer la variation du temps nécessaire à la promotion (d'adjoint à agrégé puis d'agrégé à titulaire) en fonction du sexe, de la discipline et de l'institution. Des modèles statistiques (*accelerated failure time models*) démontrent que le sexe a un léger effet sur la vitesse de la promotion mais que cet effet est moindre que celui de la discipline et de l'institution. Règle générale, les départements de

sciences et de génie ainsi que les écoles professionnelles (médecine, droit, etc.) promeuvent plus rapidement leurs professeurs, tandis que les domaines de formation pratique (soins infirmiers, travail social, etc.) sont plus lents. La variation entre institutions est considérable mais n'est associée ni à leur taille, ni à leur prestige. Ces deux facteurs affectent davantage la vitesse de promotion du rang de professeur adjoint à celui de professeur agrégé que la titularisation.

For Canadian academics, a successful career involves obtaining tenure and just two promotions, from assistant to associate professor, and then to full professor. Normally tenure is awarded with promotion to associate professor. The factors affecting promotion may be divided into four categories: 1) individuals' activities related to promotion, almost always classified into aspects of teaching, research, and service; 2) "demographic" characteristics of individuals, such as their gender, age when hired, and membership in ethno-racial groups; 3) disciplines, usually identified as departments, but sometimes as "*non*-departmentalized faculties" (such as law and education); and 4) formal and informal aspects of the promotion practices of institutions.

At each university, promotion policies take the form of agreements between administrations and their faculty, often in the contracts of faculty unions, and in less formal written agreements with non-union faculty associations. The criteria for tenure and promotion reflect the mission and goals of the institution and the professoriate's values of excellence in teaching, research, and service. The *application* of these policies, however, involves standards and values that are not explicitly agreed to or written down, and which may vary among departments. Determined largely by peer review, promotion is also subject to customs and practices of disciplines, which set standards, create values, define research fields, and legitimize methodologies.

Since the 1960s, researchers have demonstrated extensive variation in the core values and practices of disciplines (Becher & Trowler, 2001; Braxton & Hargens, 1996; Tierney, 2003). Disciplinary values, customs, and practices are not isolated, but rather are part of other cultures – particularly, the institutional and the departmental. Among other factors, they are influenced by the discipline's location in the university, in terms of resources and teaching loads, and the discipline's prestige within and outside of the institution. Faculty members' work and values are shaped by the intersection of these cultures (Clark, 1984, p. 112).

Neither disciplines nor institutions are gender neutral. Connell (2005, p. 1) states that "gender is now understood as an inbuilt feature of organizations." A large body of research on universities describes how gender shapes disciplines and shows that women lag behind men in every measure of career advancement (Begley, 2001; Bordo, 2001; Davis & Astin, 1990; Drakich et al., 1991; Ginther & Hayes, 1999; Krefting, 2003; Lewin, 2004; Ornstein, Stewart, & Drakich, 1998; Perna, 2001; Poole, Bornholt, & Summers, 1997; Szafran,

1984; Toren, 1990). Research examining tenure and promotion finds that gender differences remain after human capital and structural model variables are taken into account (Perna, 2005). Advantages experienced by men regarding promotion, especially to full professor, cannot be accounted for by differences in the research productivity, discipline, or family responsibilities of women and men (Long, Alison, & McGinnis, 1993; Billard, 1995; Long & Fox, 1995; Perna, 2001; Sax et al., 2002; Toren, 1990; Toutkoushian, 1999). Perna (2005) suggests that "institutional structures, policies, and practices disadvantage women but not men in the determination of tenure and rank" (p. 300). The research points to a complex ensemble of institutional, disciplinary, and gender influences on tenure and promotion processes. Tenure and promotion, then, are best examined by a conceptual framework that incorporates these elements.

In this paper, we use Statistics Canada's annual census of full-time faculty to estimate the effects of institution, discipline, and gender on promotion in Canadian universities between 1984 and 1999. The census is based on extracts from human resources databases from universities, so there is a large number of observations, and no sample selection bias or measurement error. The drawback is that the range of variables is very limited. For example, gender is measured but not ethno-racial identification,[1] and there are no measures of research, teaching, or service activities. Although these data are collected and normally used only in cross-sectional form, we were able to study promotion longitudinally by linking individuals across survey years. To our knowledge, this is the first systematic measure of these effects for Canada.

The context for this study is a university system that is more homogeneous than differentiated. Canadian universities offer a mix of graduate, undergraduate, and professional programs. A small number of institutions offer only undergraduate programs or have very limited graduate programs. Research is an important value at all these universities and there is not much variation in the formal expectations of research, teaching, and service. Although Canadian universities have always been differentiated in terms of size, prestige, and research activity, the increased pressure to build a "research enterprise," has narrowed the differentiation in research activity and increased the competition for research funding.

CONCEPTUAL ISSUES

Disciplines

Interest in the culture of academic disciplines is often traced to the novels of C. P. Snow, especially *The Masters* (1951) and *The New Men* (1954), and more explicitly formulated in his 1959 lecture *Two Cultures and the Scientific Revolution*. He saw the academic world as riven between the arts and science. Although characterized by Becher (1981, p. 122) as perpetuating a "crude and damaging dichotomy," debate over the divide between arts and science has continued, as the number of disciplines expanded into the hundreds by the 1990s

(Braxton & Hargens, 1996). In his 2003 presidential address to the Association for the Study of Higher Education, Tierney remarked that academics today tend to be more oriented to their disciplines than committed to their institutions. Austin (1990) and others have argued that disciplines provide the primary identification for academics, beginning when graduate student "initiates learn the language, style, symbols, traditions, and folklore of their respective disciplines as well as the appropriate professional activities" (p. 63-64).

Despite consensus that disciplines have strong and distinct normative practices, values, and approaches (as well as many common features), there is disagreement about how to conceptualize the differences. Attempts to schematize and classify disciplines identify a variety of dichotomies – hard versus soft, pure versus applied, convergent versus divergent – and also focus on the differences in the degree of codification and paradigm development. Their extensive review of studies of disciplinary frameworks led Braxton and Hargens (1996) to conclude that "differences among academic disciplines are profound and extensive" (p. 36) and that the most significant difference involves the degree of consensus. High consensus fields, such as the traditional sciences, are typified by a stronger orientation to research, higher publication rates, more time spent on research, more funding for research, and lower rates of rejection by journals. High consensus fields also "exhibit greater levels of conformity to the Mertonian research norms of universalism, disinterestedness, and organized skepticism" (p. 36). The question is whether this amounts to more than a rediscovery of a continuum between Snow's two cultures, with the social sciences somewhere between arts and science.

A postmodern twist on these arguments is Becher and Trowler's (2001) contention that disciplinary cultures vary across institutions. A discipline that is "hard" and "urban" at one institution may be "soft" and "rural" at another (p. 184). Based on an international study of 12 disciplines, they classify physics, chemistry, pharmacy, and mathematics as *mainly* hard, impersonal, experimental/numerate; while history, modern languages, sociology, and law are *mainly* "soft" (p. 186). Disciplines that are harder/purer/convergent/urban are more likely to exhibit a common intellectual style and to be more competitive, but also they exhibit more teamwork, and more rapid and frequent communication. At the other end of the scale, disciplines such as humanities and sociology are characterized by little consensus on central paradigms, and they are more individualistic, less community oriented, and have a research focus on longer range problems. This too sounds like Snow's dichotomy, throwing in the recognition that disciplines are divided, for example, between physical and social anthropology or between theoretically-oriented, more qualitative, and more quantitative departments of geography, political science, and sociology.

Despite the extensive focus on typologies of disciplines, there is little empirical evidence about the relationship between disciplinary cultures and reward systems (Hearn & Anderson, 2002). Still, were we to proceed in the (often inappropriate) vein of thinking that quantitative research should test a "hypoth-

esis," the logic is that fields characterized by high communication within and between specialities and more intellectual consensus – "hard" science compared to the "soft sciences" (social science and the humanities) – have faster rates of promotion.

Institutions

On the ground, promotion is a bureaucratically organized activity based on the collected judgements of colleagues, committees, and university officials. Differences among universities must reflect features of the process, such as the number of levels of adjudication and the requirements at each level, as well as systematic differences in the standards of judgment. The question is whether and how these are related to readily observable features of universities, such as their size.

The literature offers some clues. Potentially, many different factors affect university cultures, including the balance of gender and ethno-racial groups, the mix of disciplines and faculties (especially the presence or absence of professional schools), the emphasis on graduate versus undergraduate education, their individual missions, the leadership styles of deans, vice-presidents academic, presidents, and boards, as well as their formal and informal organization. Some analysis has found that size of institution, urban/rural status, and region affect organizational change (Baron, Mittman, & Newman, 1991; Drakich et al., 1991). Gumport and Snydman (2002) argue that the formal "organizational structures of departments and degree programs are defining features of academic organizations" (p. 384). In what amounts to an argument for potentially idiosyncratic differences among institutions, Tierney (1988) locates the roots of internal culture in the history of individual institutions, reflected in "the values, processes, and goals held by those most intimately involved in the organization's workings" (p. 3). For Austin (1990), the university's mission is critical: large research institutions tend to undervalue teaching in favour of research productivity, whereas at state universities there may be pressures on faculty to maintain a research program while carrying a heavy teaching load.

Although we should determine whether different "types" of universities have varying rates of promotion, previous research on institutions provides little basis to formulate hypotheses. We might, for example, argue that all faculty members at science-dominated institutions will feel the effect of promotional practices in more consensual, "harder" disciplines. But it is equally plausible that promotion at, say a smaller undergraduate-oriented university, will reflect a consensus on the importance of teaching smaller classes. A more exploratory approach to institutional differences makes more sense.

Gender

It is a truism that women lag behind their male peers in terms of academic achievement, including appointment to tenure-track positions and promotion

through the ranks. In Canada, women are earning a growing share of doctoral degrees, but they are less likely than men to be hired into tenure-track positions (Drakich & Stewart, 2007). In the absence of current Canadian research, we note that studies of the United States, the UK, and Australia consistently find that women are also less likely to achieve tenure and then be promoted (Allen & Castleman, 2001; Krefting, 2003; Mumford & Propper, 2000; Ward, 2001). According to recent studies in the United States, patterns of disadvantage in appointment and promotion processes are especially prevalent in science. Lewin, (2004) found a large gap between the number of degrees awarded to women and the number of women hired into US research universities. For example, 20.5% of computer science doctorates are awarded to women, who account for only 10.8% of assistant professors in that discipline. In the "top engineering and science departments," according to Lewin, only 3 to 15% of full professors are women. Kulis, Sicotte, and Collins (2002) found that representation by women in tenured ranks of *all* the science disciplines falls short of their representation in the doctoral pool. Available data from Statistics Canada are not dissimilar. Women are appointed to faculty positions in engineering at about the same proportion, 14%, as their representation in pool of Ph.D. degree holders, but in "mathematics and physical sciences" they are hired below their representation in the pool – 19% compared to 26%.[2]

In Canada and the United States women hold about one third of all faculty positions and in both countries women are far less likely to be in the senior ranks (Billard, 1995; Dagg & Thompson,1988; Drakich et al., 1991; Ginther & Hayes, 1999; Goyder, 1992; Ornstein, Stewart, & Drakich, 1998; Toutkoushian, 1999). Another example of disadvantage of women in promotion to prestigious positions is their underrepresentation in the Canada Research Chair Program (CRC). In 2000, the CRC program was initiated to establish 2000 chairs by the year 2008. As of December 2006, only 23% of the chairs have been awarded to women. Fewer women CRC holders have the senior, Tier I position than the junior, Tier II position (32% and 68%, respectively).

On the one hand, structural models posit that gender differences in academic careers are "attributable to the segregation of women in the types of institutions, disciplines, work roles that have lower prestige and value" (Perna, 2005, p. 280). Using Statistics Canada's census of academics, Ornstein, Stewart, and Drakich (1998) found that, in 1994, men were 24.1% more likely than women to be full professors; holding constant the variables age and length of employment reduced the male/female difference to 14.5%, leaving a substantial gap unexplained by personal or institutional factors. The unexplained gender difference is consistent with the large body of research cited earlier. Smart (1991) and others conclude that gender is more important to academic rank than institution, discipline, or the nature of work. On the other hand, human capital models assume that differential career progress by women is a consequence of a lower investment in their academic careers. Since women need greater flexibility in their work lives than men to meet the demands of family,

pregnancy, and childcare, their ability to invest in the male model of academic success is constrained. Not surprisingly, then, explanations for gender differences have focused upon individual-level differences in research productivity and family responsibilities. Perna (2005) found that the effect of family responsibilities on tenure and promotion is different for men than for women. Men appear to benefit from having children and being married. They are *more* likely to be in tenure-track positions and to hold the rank of full professor if they have children and a partner. One persistent difference that might explain a gender difference in promotion is greater research productivity by men, argued to be a result of having more time to allocate to research, earlier and more consistent mentoring, and uninterrupted career paths compared to women. Toutkoushian (1999) found that gender differences in rank achievement remained, especially in terms of promotion to full professor, when factors including productivity, gender, race, highest degree, experience, institution, and field were controlled. A more general methodological concern is whether the estimated effects of gender are affected by "unmeasured variable bias," so that it reflects partly, say, the negative impact on careers of having and caring for children.

Although the overwhelming weight of evidence suggests we should hypothesize that women are promoted more slowly, empirical studies of promotion are sparse, few are recent, and there is little Canadian research. Moreover, the direction of the gender difference is likely to be less important than its magnitude.

DATA AND STATISTICAL METHODS

The measures available from Statistics Canada's survey of full-time university faculty describe only their gender, date of birth, current rank, date of appointment, appointment status, salary, department, and discipline; where "full-time" refers to people who work for at least 12 continuous months, although not necessarily in a "tenure-track" position. The original data consist of a series of annual snapshots, whose major use appears to be to provide salary statistics to faculty associations and university administrations engaged in bargaining. In order to study promotion, with Statistics Canada's assistance we created a longitudinal data set that enables us to follow individuals between 1985 and 1999. Naturally, the analysis is restricted to faculty members for whom there is information from two or more consecutive years. Thus, for persons appointed in 1998 there is only one year to look for a promotion, for persons appointed in 1997 there are two years to look for a promotion, and so on.

Unfortunately, we are unable to track faculty who move between universities, so this analysis is limited to the majority of faculty who remain at a single university. Ideally, to provide a full analysis of academic career progress we would have followed individuals as they move from institution to institution or exit the academy altogether. Limitations of the Statistics Canada survey of full-time faculty, however, do not provide this opportunity. Nevertheless, recent data from Statistics Canada on new faculty appointments show that over the

period of the initial six years of the current hiring curve – 1999 to 2004, fewer than 7% of new hires were appointed at the rank of full professor and fewer than 13% were appointed at the rank of associate professor.[3] These findings reflect the limited movement of senior faculty between universities in a period of unparalleled hiring since the 1960s. We believe that senior faculty mobility during the period of this study would have also been limited.

Promotion involves the "hazard" of an irreversible transition from assistant to associate professor and from associate to full professor. Three different kinds of statistical models are applied to data of this kind: regression models of the length of time until a transition; discrete time or "event history" models of the probability of a transition from each year to the next, in which each individual is represented by one record for each pair of adjacent years, up until the transition; and "mixed models" which characterize each person's trajectory over time, in this case, from the position of assistant to associate to full professor. Due to statistical differences between the techniques, the three kinds of models give consistent, but not identical results. These models are necessary, and conventional regression does not work, because the data are "*right* censored," that is some faculty members will not have experienced a promotion during the period for which we have records. This unavoidable feature of data of this type requires statistical methods that do *not* discard observations with "incomplete" spells, in order to avoid giving too much influence to the experience of persons experiencing more rapid promotion.

We used regression models because the results focus directly on the length of time until a person is promoted and they are easier to interpret. Also, our data meet the necessary condition that the predictors, such as gender and discipline, do *not* change over time. While "Cox proportional hazard" models are most commonly used for this analysis, they require the assumption that the effects of predictor variables do not change over time. Inspection of our data, however, showed that the effect of gender on promotion violates this assumption. It turns out that gender has a much stronger effect on the probability of being promoted very rapidly than on the probability of promotion in later years. For this reason, we employed "accelerated failure time" or AFT models.[4]

AFT models look just like regression models, in that the regression coefficients measure the effect of various characteristics of an individual – her or his gender, discipline, and so on – on how long it takes for a person to be promoted. The model also provides estimates of the "standard error" of coefficients, to allow a determination of whether the effect of a variable is statistically significant. AFT models do not predict "raw" time itself (in this case, years until promotion), but rather the logarithm of time, so their effects of the predictors on time are multiplicative rather than additive. Therefore, it is much easier to understand the results by examining the time (to promotion) predicted by each model rather than the regression coefficients. Because the distribution of time is positively skewed, it is conventional to predict each person's *median* time until promotion rather than her or his *mean* time, the more usual outcome for regres-

sion models.[5] For example, Table 2 gives the expected median time for promotion from assistant to associate professor and from associate to full professor for each university. A good summary of AFT models and their implementation is Cleves, Gould, and Guttierez (2004).

DATA ANALYSIS

Effects of Gender, Discipline, and Institution on Promotion

Tables 1 and 2 give the estimated median time to promotion for men and women, disciplinary fields, and institutions from an AFT model with all three variables.[6] This model assumes equal gender differences within disciplines and institutions. On average, men are promoted to associate and to full professor faster than women. The median promotion times from assistant to associate professor are 4.92 years for men and 5.39 years for women, a difference of .47 years; and for promotion to full professor, they are 8.83 and 9.74 years respectively, favouring men by a difference of .91 years. Both differences are statistically significant at .001, as the numbers of observations are very large, 18,269 and 20,804 for the two levels of promotion, respectively.

In all but 3 of the 22 major disciplinary areas, the median time for promotion to associate professor is between 4.5 and 5.7 years. This compressed distribution reflects the "up or out" rule for tenure, combined with the widespread practice of granting tenure and promotion to associate professors at the same time. First promotion takes longest in journalism, nursing, and "other health professions," respectively 5.92, 6.45, and 7.49 years. These are fields strongly oriented towards training practitioners and in which significant numbers of faculty do not have doctoral degrees (though this is changing, especially in nursing). Consistent with arguments about the "two cultures," the shortest median times are engineering, science, mathematics, and computer science.

Much larger disciplinary differences are found in the median time for promotion to full professor, and the pattern is unmistakable. Five disciplinary areas have median times between seven and eight years: engineering, science, mathematics, pharmacy and optometry (which are combined), and biological science; and five areas have median times over ten years: "education (not elsewhere specified),"[7] nursing, fine and applied arts, other health professions, and journalism – all of which are oriented to training practitioners. Just after "hard science," with median times between 8.26 and 8.70 years, are law, theology, and medicine, along with newcomer "computer science." The other eight disciplinary areas had median times between 9.21 and 9.96 years, with the longest times (over 9.9 years) for education, physical education (including kinesiology and recreation) and the humanities, which includes literature, languages, philosophy, and some area studies. The median time for social science is 9.62 years, and for business and administration, 9.76 years. The difference between the mainstream science disciplines and the social sciences and humanities is around 2.5 years, much larger than the .91 year gap between women and men.

Table 1 Estimated Median Time for Promotion to Full and to Associate Professor, by Gender and Major Discipline

	Estimated Median Time for Promotion		Number of Observations	
	to Full Professor	to Associate Professor	to Full Professor	to Associate Professor
Total	9.07	5.09	20,804	18,269
Men	8.83	4.92	15,298	11,692
Women	9.74	5.39	5,506	6,577
Engineering	7.06	4.43	1,675	1,516
Science	7.17	4.57	1,126	960
Mathematics	7.63	4.59	730	631
Pharmacy & Optometry	7.68	5.35	123	146
Biological Science	7.89	4.94	1,494	1,318
Law	8.26	4.78	403	312
Theology	8.37	5.72	326	301
Medicine	8.52	5.65	3,014	2,894
Computer Science	8.70	4.67	535	427
Library Science	9.21	5.54	69	63
Rehabilitation	9.32	5.68	177	219
Dentistry	9.46	5.67	184	142
Social Science	9.62	4.87	3,519	3,052
Business & Administration	9.76	5.34	1,552	1,415
Education	9.91	5.08	1,059	768
Physical Education, Kinesiology, Recreation	9.95	4.82	425	317
Humanities	9.96	4.94	2,460	2,239
Education, not elsewhere specified	10.42	4.83	384	283
Nursing	10.48	6.45	419	382
Fine & Applied Arts	11.24	5.38	944	731
Other Health Professions	15.42	7.49	144	115
Journalism	15.60	5.92	42	38

Because there are more women in slower-promoting disciplines, the "unadjusted" effect of gender is a bit larger, 1.10 years.

Across disciplines, the correlation between the median times for the two levels of promotion is fairly high at .48, but mainly because of just two influential observations, for "other health professions" and journalism, with high values for both variables. Removing them, the correlation drops to just .18; and it falls further to only .11 if nursing is also dropped. This suggests that quite separate mechanisms govern the timing of the two levels of promotion.

For convenience, the numerous entries for institutions in Table 2 are arranged in order of the predicted median time for promotion to full professor *within* the three categories of institutions adopted by Maclean's Magazine for its annual "University Rankings" issue, with a fourth category added for "smaller institutions" not classified by Maclean's. The Maclean's categories are: "medical-doctoral" institutions, with medical faculties and a broad range

Table 2.
Estimated Median Time for Promotion to Full and to Associate Professor, by Institution Categorized According to Maclean's Magazine Groups

	Estimated Median Time for Promotion		Number of Observations	
	to Full Professor	to Associate Professor	to Full Professor	to Associate Professor
"Medical-Graduate" Institutions				
Université Laval	6.64	4.53	919	751
University of Alberta	7.54	4.75	745	669
University of Saskatchewan	7.61	4.13	631	577
Université de Montréal	7.89	4.78	1,110	816
University of Toronto	7.89	5.80	1,203	1,361
University of British Columbia	7.91	5.61	908	853
Queen's University	8.35	5.88	495	512
University of Calgary	8.40	4.56	839	714
McMaster University	8.49	5.70	595	532
Ontario Institute for Studies in Education	8.56	4.87	63	25
Université d'Ottawa	8.67	5.40	716	567
University of Manitoba	8.93	5.06	679	677
Université de Sherbrooke	9.00	4.14	480	414
University of Western Ontario	9.00	5.77	776	903
Dalhousie University	9.17	5.32	569	452
McGill University	10.24	5.67	909	685
Median	8.44	5.19		
"Comphrensive" Institutions				
University of New Brunswick	8.02	3.97	355	285
University of Windsor	8.36	4.44	253	217
University of Victoria	8.51	4.76	357	286
University of Waterloo	8.83	5.30	486	434
Simon Fraser University	8.86	4.69	347	241
Université du Québec	9.27	4.04	1,779	960
University of Regina	9.77	5.34	221	221
Carleton University	10.01	4.11	352	267
University of Guelph	10.22	5.91	381	293
Memorial University of Newfoundland	10.55	5.77	598	486
York University	13.24	4.51	514	539
Concordia University	14.24	5.29	435	425
Median	9.52	4.73		

Continues on next page

	Estimated Median Time for Promotion		Number of Observations	
	to Full Professor	to Associate Professor	to Full Professor	to Associate Professor
"Primarily Undergraduate" Institutions				
Ryerson Polytechnical University	6.35	4.74	36	95
Bishop's University	7.43	3.70	63	63
Université de Moncton	7.93	5.94	291	223
St. Thomas University	8.17	6.41	31	53
St. Mary's University	9.03	4.39	119	133
Wilfrid Laurier University	9.24	5.01	181	186
University of Winnipeg	9.47	3.82	134	95
University of Prince Edward Island	9.64	4.80	99	127
Mount Allison University	9.70	5.05	71	77
Trent University	9.72	4.46	94	120
Acadia University	9.80	5.09	132	135
Lakehead University	9.82	4.92	164	138
Laurentian University	10.09	6.02	347	294
University of Northern British Columbia	10.44	4.29	37	80
University of Lethbridge	10.60	5.07	155	146
St. Francis Xavier University	10.97	4.90	120	147
Brandon University	12.03	5.87	90	85
Brock University	12.12	4.14	199	186
Mount St. Vincent University	12.44	5.89	109	97
University College of Cape Breton	14.89	4.97	64	65
Nipissing University	16.07	6.45	26	63
Median	9.80	4.97		
Smaller Institutions				
Canadian Union College	6.36	3.96	24	22
Royal Military College	7.13	5.31	100	102
Nova Scotia Agricultural College	7.55	4.65	64	30
Technical University of Nova Scotia	7.74	4.07	60	41
Concordia College	8.05	4.56	31	43
Université Sainte-Anne	8.61	5.65	21	20
Royal Roads Military College	9.43	3.93	22	17
Redeemer College	10.38	4.91	22	29
Augustana University College	11.27	6.36	44	60
Trinity Western University	12.23	6.59	47	45
Nova Scotia College of Art and Design	12.86	7.37	30	19
The King's College	18.78	5.13	21	24
Collège militaire royal de Saint-Jean	19.42	5.03	41	17
Median	9.43	5.03		

of doctoral programs and research; "comprehensive" institutions, with a wide range of graduate and undergraduate programs and significant research activity; and "primarily undergraduate" institutions that offer mainly undergraduate programs with a few graduate programs (Johnston & Dwyer, 2004).

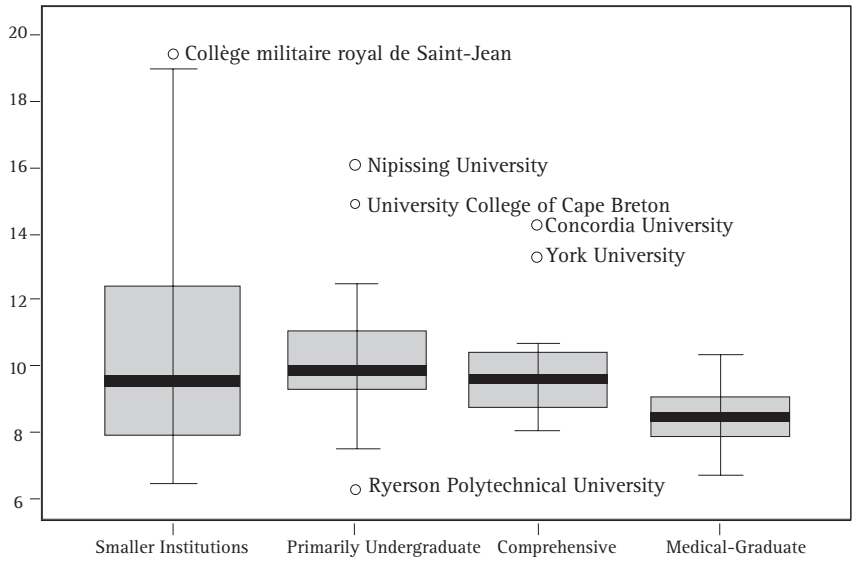
Accounting for disciplinary differences, the institutional variation in the median times to promotion is clearly greater than the variation among disciplines or the gender differences. Across institutions the correlation between the median times for promotion to associate and to full professor is very low, just .08, and there is much less institutional variation in the time for promotion to associate professor. The logic is that disciplinary and institutional variation in promotion to associate professor is severely limited by the near universal practice of granting tenure, or not, by the sixth year and by the custom of not granting it until after five or six years of employment. Earlier awards of tenure often involve unusual circumstances, such as previous experience teaching and/or doing research at another institution.

There is wide variation in the median time for promotion to full professor. Excepting the high outliers, there is a fairly uniform distribution of institutions between Bishop's University, at 7.43 years, and McGill University, at 10.24 years. The distribution is positively skewed. Only Ryerson Polytechnical University, Canadian Union College, and Laval University have medians under seven years. Five institutions have median times between 12 and 13 years, Brandon University, Brock University, Trinity Western University, Mount St. Vincent University, and the Nova Scotia College of Art and Design. At the extreme end, there are four small institutions with *very* high medians, the University College of Cape Breton, Nipissing University, The King's College, and the College Militaire de St. Jean, respectively, 14.89, 16.07, 18.78, and 19.42 years.

The old, elite institutions in Maclean's "medical-graduate" category tend to have more rapid promotion and there is also low variation in this category. The median of the "medical-graduate" median times is 8.44 years versus 9.52 years for "comprehensive" institutions, 9.80 years for "primarily undergraduate" institutions, and 9.43 for "smaller" institutions. The University of Alberta, the University of Montreal, the University of Toronto, and the University of British Columbia have median times below eight years, though other, similarly historic institutions are near the centre of the overall distribution. The figure for the University of Western Ontario is nine years and for McGill over 10 years.

Among the "comprehensive" institutions, York University and Concordia University have unusually high median times for promotion to full professor, 13.24 and 14.24 years, respectively. While there are too few cases to make a strong argument about their uniqueness, both these institutions are relatively young, strong in the social sciences, humanities, and creative arts, and compete with established elite institutions in the same city. Simon Fraser University and Carleton University, however, which are similar, do not have unusually long median times, 8.86 and 10.01 years, respectively. This suggests that distinct features of the each institution are critical.[8]

Chart 1. Median Time for Promotion to Full Professor in Years by Type of Institution



The boxplot in Chart 1 shows a lower median time and less variation among institutions in the time for promotion to full professor within the "medical-graduate" category. It identifies Concordia University and York University as high outliers among the "comprehensive" universities; Nipissing University and the University College of Cape Breton as high outliers and Ryerson Polytechnical University as a low outlier among "primarily undergraduate" universities; and the high variation between the "smaller institutions."

In a regression taking the institutions as observations, we find that the median time of promotion to full professor is 1.6 years longer at "comprehensive universities," 1.9 years longer at "primarily undergraduate" institutions, and 2.4 years longer at "smaller institutions," compared to "medical-graduate" universities (all three differences are statistically significant at .05). Whether the faculty are unionized, we find, has essentially no impact on the time for promotion to full professor. Similar analysis of the time for promotion to associate professor turns up no differences among types of institutions, but suggests (significant at .01, not at .05) that unionized institutions have slightly shorter promotion times, by .55 year. The suggestion is that the increased regulation of unionized environments affects the process of promoting and tenuring younger faculty, but has little effect on promotion to full professor, where prestige but not a person's job is at stake. This finding is more striking in light of the much greater variation in the time of promotion to full professor.

Gender Differences within Disciplines and Institutions

Tables 3 and 4 give the results of estimating AFT models for the time for promotion to full professor using detailed disciplines and institution as predictors, separately for women and men. In some disciplines the number of observations for women (in dentistry and journalism), men (in nursing), or both women and men (journalism) is very small. Institutions with less than 10 observations for men or for women are omitted. The latter criterion leaves data for just three "smaller institutions," so that category is excluded from the Table.

The median time for promotion for women is around 2.5 years longer than that for men in "physical education, kinesiology and recreation" (combined), "other health professions," and rehabilitation. In engineering, science, and biological science, the times are, respectively, .87, 1.13, and 1.30 years longer for women. The median time to promotion for women is about 1.25 years shorter in both categories for education, and also in the humanities by .68 years, and in library science, by .63 years.

Table 3
Median Time for Promotion to Full Professor for Women and Men, by Discipline
Ordered by Magnitude of Gender Difference, Controlling on Institution

	Median Time to Promotion in Years			Number of Observations	
	Men	Women	Difference	Men	Women
Dentistry	10.86	7.94	2.92	162	22
Journalism	16.84	14.97	1.87	31	11
Education	10.84	9.47	1.37	606	433
Education , not elsewhere specified	12.48	11.21	1.26	201	171
Humanities	11.27	10.59	0.68	1,484	875
Library Science	10.44	9.82	0.63	32	37
Computer Science	9.79	9.30	0.49	459	57
Fine & Applied Arts	12.42	12.01	0.41	614	317
Business & Administration	11.10	10.73	0.37	1,258	277
Medicine	8.57	8.38	0.18	2,440	573
Law	8.62	8.50	0.13	246	157
Math	8.70	8.81	-0.11	594	104
Theology	9.51	9.80	-0.29	251	62
Pharmacy & Optometry	7.60	7.92	-0.32	87	36
Social Science	10.22	10.64	-0.42	2,388	1,048
Engineering	7.27	8.14	-0.87	1,464	127
Science	7.33	8.46	-1.13	956	110
Biological Science	7.82	9.12	-1.30	1,115	360
Nursing	10.07	11.53	-1.45	15	401
Physical Education, Kinesiology, Recreation	10.78	13.14	-2.35	290	118
Other Health Professions	9.81	12.25	-2.44	107	37
Rehabilitation	8.84	11.52	-2.68	76	101

The variation in the treatment of women and men by institutions is much greater than the variation among disciplines. There is some variation among the Maclean's categories. The median of the median time until promotion to full professor is .64 years longer for women in "medical-graduate" institutions and .34 years longer in "comprehensive" institutions, but .64 years *shorter* for women in "primarily undergraduate" institutions. There is much more variation *within* the three categories. Accounting for discipline, the median time to promotion is 3.87 years longer for women than men at Memorial University and 3.19 years longer at the University of Waterloo, 2.95 years longer at Laurentian University, and 2.02 years longer at McGill University; somewhat small differences favour men by 1.92, 1.69, and 1.53 years at the University of Regina, Concordia University, and the University of Western Ontario, respectively. Overall, differences favouring men ranging from around zero to 1.4 years are close to the norm. Universities with no appreciable gender difference in median times to promotion, such as Laval University, the University of Ottawa, Lakehead University, and the University of British Columbia, are in the minority.

At some institutions women are promoted more rapidly than men, by more than three years at Acadia University, the Ontario Institute for Studies in Education (now part of the University of Toronto), and the University College of Cape Breton, by around 2.25 years at the University of Prince Edward Island and Mount Allison University, and by between one and two years at Carleton University, Brandon University, Wilfrid Laurier University, Simon Fraser University, Mount Saint Vincent University, and Ryerson Polytechnical University. Women also have markedly shorter promotion times at a number of small Atlantic Canada universities – the samples are small, but the findings are consistent. Adjusted for discipline, the difference is more than two years at the University College of Cape Breton, Acadia University, Mount Allison University, and the University of Prince Edward Island; the exception is St. Francis Xavier University, where the median promotion is .89 years longer for women than men.

CONCLUSION

Across disciplines and at different institutions, women and men achieve first promotion to associate professor in roughly the same time, though the approximately half year difference in the median times favours men. No doubt this reflects "up or out" institutional rules that set limits on when tenure-track faculty must be considered for tenure. Other work (Stewart, Ornstein, & Drakich. 2006) with these data shows that achieving tenure is nearly universal at Canadian universities. Although our Statistics Canada data show people who leave the university because they are denied tenure as "censored" – they merely vanish from the dataset – detailed inspection of the time distribution of censoring shows *no* peak in the five to seven year range, when faculty members denied tenure would leave.

Accounting for disciplinary and institutional differences, men achieve promotion to full professor about a year faster than women, and the difference is

Table 4
Median Time for Promotion to Full Professor for Women and Men, by Institution. Categorized Within Maclean's Magazine Groups in Order of Greatest Differences, Controlling on Detailed Discipline

	Median Time to Promotion in Years			Number of Observations	
	Men	Women	Difference	Men	Women
"Medical-Graduate" Institutions					
Ontario Institute for Studies in Education	12.46	7.76	-4.70	34	29
Dalhousie University	9.70	9.16	-0.53	420	149
University of Toronto	8.93	8.80	-0.13	906	297
University of British Columbia	8.05	8.05	0.00	689	219
Université d'Ottawa	9.56	9.61	0.04	537	179
Université Laval	6.79	6.89	0.10	705	214
University of Alberta	7.54	7.74	0.21	529	216
University of Manitoba	9.68	10.15	0.47	508	171
University of Calgary	8.66	9.47	0.81	624	215
Queen's University	8.41	9.33	0.92	348	147
Université de Sherbrooke	7.78	8.78	1.00	378	102
Université de Montréal	7.89	8.92	1.04	786	324
University of Saskatchewan	7.91	8.99	1.08	475	156
McMaster University	8.42	9.88	1.46	441	154
University of Western Ontario	9.88	11.42	1.53	615	159
McGill University	10.58	12.59	2.02	664	245
Median	8.54	9.07	0.64		
"Comphrensive" Institutions					
Simon Fraser University	9.13	7.51	-1.62	244	103
Carleton University	11.30	10.23	-1.07	249	103
Université du Québec	10.28	10.04	-0.24	1,323	456
University of New Brunswick	6.91	6.81	-0.10	253	102
York University	14.71	14.62	-0.09	293	221
University of Windsor	9.89	10.17	0.29	155	98
University of Victoria	8.95	9.34	0.39	245	112
University of Guelph	10.36	11.59	1.23	291	90
Concordia University	14.91	16.60	1.69	297	138
University of Regina	9.48	11.40	1.92	164	56
University of Waterloo	9.28	12.46	3.19	381	105
Memorial University of Newfoundland	10.65	14.52	3.87	439	159
Median	10.08	10.82	0.34		

Continues on next page

	Median Time to Promotion in Years			Number of Observations	
	Men	Women	Difference	Men	Women
"Primarily Undergraduate" Institutions					
University College of Cape Breton	17.48	11.28	-6.21	48	15
Acadia University	11.55	8.05	-3.49	97	35
Mount Allison University	10.30	7.94	-2.36	55	16
University of Prince Edward Island	11.12	8.86	-2.26	73	26
Ryerson Polytechnical University	7.44	5.53	-1.91	20	15
Mount St. Vincent University	14.59	12.86	-1.72	48	60
Wilfrid Laurier University	10.28	8.93	-1.35	139	42
Brandon University	13.26	12.04	-1.23	72	18
University of Winnipeg	10.22	9.57	-0.65	92	42
Trent University	11.18	10.56	-0.63	56	37
St. Mary's University	9.67	9.05	-0.62	93	25
Université de Moncton	8.12	7.67	-0.46	211	78
Brock University	13.86	13.84	-0.02	131	68
Lakehead University	11.02	11.01	-0.01	123	41
Bishop's University	6.74	7.07	0.33	50	13
St. Francis Xavier University	10.73	11.62	0.89	87	31
University of Lethbridge	11.42	12.45	1.03	116	39
Laurentian University	12.31	15.25	2.95	267	78
Median	11.07	10.06	-0.64		
Smaller Institutions					
Nova Scotia College of Art and Design	11.10	13.04	1.95	15	15
Trinity Western University	12.69	15.39	2.70	37	10
Nova Scotia Agricultural College	8.38	13.04	4.67	53	11
Median	11.10	13.04	2.70		
Total	9.51	10.20	0.69	14,876	5,434

larger in the traditionally male fields of science and engineering. Our findings are consistent with the overwhelming majority of studies internationally which find that a gender difference in promotion to full professor remains, even when institution and discipline are taken into account.

The weak correlation between the median times of promotion to associate and to full professor, comparing both disciplines and institutions, suggests that the two processes are not strongly related, mainly because there is relatively little variation in the time for promotion to associate professor. The median time to promotion to full professor varies from a low of seven years to 15.6 years. Unlike tenure and promotion to associate professor, individual faculty must self-select to be considered for promotion to full professor. It is reasonable to assume that in the context of ambiguous expectations for promotion to full professor and the burden of preparing promotion applications that women and men may be reluctant to seek promotion. Research reveals reticence by women in applying for promotion (Winchester et al., 2006). It is tempting to consider whether

procedures to encourage and support faculty to seek promotion would increase the number of full professors, particularly, the number of women faculty.

Generally, women are promoted more rapidly than men in disciplines where they are better represented, including education, the humanities, medicine, and fine arts. The results show evidence of persistent overall gender discrimination in promotion, but not support for categorical statements about the lack of progress by women or pervasive differences across institutions and disciplines.

Even in the increasingly managerial and interdisciplinarity world of the university, disciplines strongly influence academic careers. Despite the efforts to characterize disciplines in a more sophisticated fashion, for example by Becher and Trowler (2001), our data suggest that Snow's (1959) simple conceptualization of two cultures is quite sufficient, although there is a continuum stretching from the "hardest" sciences (natural science, engineering, and mathematics), through the less hard sciences (medicine), the harder social sciences (law and criminology), the softer social sciences (the humanities and fine arts), with practitioner-dominated disciplines, such as journalism, at the end. This continuum corresponds to disciplinary differences in the speed of promotion (shorter times in "harder" areas) and to the relative position of women in disciplines (better in softer areas).

The most surprising finding is that the institutional differences in promotion times are greater than the disciplinary differences and much greater than the effect of gender. The large, elite, science-oriented institutions have lower promotion times. This suggests that the shorter promotion times of the scientific disciplines lower the average times for faculty from all disciplines in institutions where science is more prominent and where there are medical schools.

Commonly, cross-sectional data are used to analyze the distribution of ranks as a function of age, gender, and other personal and institutional characteristics. Although providing a descriptive profile of faculty, such a comparison does not provide estimates of the relative effects of different factors on promotion, because it does not directly "model" the process. Our use of longitudinal data and statistical techniques is not common, indeed we know of no previous example. We estimate effects on the time until promotion, accounting for persons who drop out without being promoted and who have not yet been promoted when data collection was completed. What is especially important is that our measures of the promotion step get outside the usual focus on the predominance of male full professors, which, in Canadian universities, reflects hiring patterns of the 1960s and 1970s.

There is much previous research on gender and what we contribute is a precise measure of its impact. These data establish the magnitudes of gender, disciplinary, and institutional effects on promotion, free of concerns about sample selection bias with a voluntary survey of individual faculty. In terms of discipline, we show that a broader version of the traditional conception of the arts-science divide describes our findings well. The most interesting and surprising effects have to do with institutions. Older, elite universities have somewhat

more rapid promotion than other institutions, and there is relatively little variation among them, suggesting they share an institutional culture with respect to promotion; other institutions have longer promotion times and much wider variation, suggesting the effects of local "cultures," embodied in organizational practices and structures. The organizational side includes who has responsibility for developing the file, what reviews and documentation are required, whether the originating committee is an advocate or judge, and the number and relationships between committees and individuals deciding the outcome. Institutions also vary in the status and monetary incentives for promotion. The unexplained variation among institutions suggests the combined effects of persistent organizational and institutional cultures. An important next step in research is to understand them. Future research should explore the ways in which policies and procedures impede and promote progress to the rank of full professor, ideally with data describing the demographic characteristics of individual faculty members and their research, teaching, and service records.

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FOOTNOTES

1. The absence of population data on ethno-racial identification (also First Nations ancestry and disability) information is a major problem in determining the designated group status representation among university faculty and an effective obstacle to equity policies. Canadian universities with over a certain, quite low, minimum in federal funding are covered by the Federal Contractors Program, which mandates the collection of such data. But the results of the required surveys measuring gender, First Nations ancestry, ethno-racial identification, and disability are voluntary and collected with a pledge that they will not become part of universities' personnel records. In terms of equity policies, the result is to privilege gender, which by historical accident is recorded everywhere.
2. A special run was provided by Statistics Canada, Centre for Education Statistics on new appointments by gender by department from 1999 to 2004 from the full-time faculty survey UCASS, and Ph.D. degrees awarded by classification of instructional programs (CIP) by gender for 1998 to 2003 from the Enhanced Student Information System.
3. A special run was provided by Statistics Canada, Centre for Education Statistics, UCASS, on new appointments by gender by rank from 1999 to 2004 from the full-time faculty survey.
4. Accelerated failure time models are parametric models whose form varies according to the observed distribution of failure times. Most appropriate for these promotion data is a log-logistic model, which is characterized by a very low initial hazard rate (almost no one is promoted after just a year or

two), a rise to a sharp peak at about five years for promotion to associate professor and about eight years for promotion to full professor, then a very slow decline in the hazard rate that does not reach zero in the maximum time covered by the data. The analysis was conducted using STREG in STATA. A nice discussion of accelerated failure time regression and its implementation in STATA may be found in Statacorp, 2003 (p. 195ff).

5. It is not quite true that the median times are a simple, more concrete reflection of the coefficients from the accelerated failure time model. Although negative coefficients correspond to shorter median promotion times and positive coefficients to longer times, the medians are a monotonic but not linear function of the linear prediction. This is because the AFT model does not actually "fit" the medians, but rather is a maximum likelihood procedure. Of course, the medians are estimated with error.
6. In order to conserve space, the reported results are for 24 broad fields of study. The regression is based on 142 detailed fields of study. For example, "social science" includes criminology, demography, economics, geography, and nine other disciplines. The effects of gender (in Table 1) and institution (in Table 2) are controlled for detailed discipline.
7. This category is used by Statistics Canada for educational fields too small or specialized to be classified separately. The fields that are separately classified and so *not* in this group are elementary/secondary teacher training, higher education/post secondary teacher education, kindergarten, pre-school teacher training, school librarianship, education administration, education psychology, guidance and counselling, curriculum specialization, measurement and evaluation, education foundations, other non-teaching fields, physical education, kinesiology, and recreation.
8. At York, a reform of tenure and promotion procedures in 2002 (our data end in 1999, remember) put an end to a three-way dispute among the university administration, the faculty association, and the senate, that begin in 1976, when the York University Faculty Association was certified.

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