



A degree of change

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Over the past decade and a half, the number of women attending Canadian universities has risen substantially. This trend has been particularly evident at the undergraduate level where the increase of women has far outpaced growth in the number of men. As a result, in 1990, women received 56% of all bachelor's degrees (1) granted by these institutions, up from 44% in 1975.

An important feature of this growth has been women's entry into fields of study that have traditionally been the domain of men. By the beginning of the 1990s, the proportion of women among the graduates of certain disciplines had risen to the point where these fields could no longer be considered male-dominated. This article explores the extent to which women's representation has increased among bachelor's degree graduates in male-dominated disciplines since the mid-1970s. It also examines how these shifts occurred. In some disciplines, the number of female graduates grew faster than the number of male graduates; in others, there was an increase in the number of women but a decline in the number of men.

Defining male-dominated disciplines

Some fields of study C education and nursing, for example C have long been associated with women, while others, such as engineering and physics, have been somewhat unusual choices for female students. For analytical purposes, however, a statistical measure of women's representation in the various disciplines is needed.

Generally, women are "under-represented" in disciplines where the percentage of female graduates is less than the overall proportion of bachelor's degrees awarded to women. For instance, if women comprised 30% of all bachelor's degree recipients, they would be under-represented in a discipline with 15% female graduates. On the other hand, in a discipline with 45% female graduates, women would be "over-represented."

These proportions can be expressed as "coefficients of representation." A coefficient of 1.00 means that

the sex composition of a discipline's graduates is the same as that of all bachelor's degree graduates. A coefficient less than 1.00 indicates a discipline in which women are under-represented; a coefficient greater than 1.00 denotes a discipline in which women are over-represented. In the example above, the discipline with 15% female graduates would have a coefficient of 0.50 (15 divided by 30), while the discipline with 45% women would have a coefficient of 1.50 (45 divided by 30).

To highlight disciplines that are unusual choices for women, fields of study have been arbitrarily defined as male-dominated, neutral, or female-dominated on the basis of their coefficients in 1975. Disciplines with a coefficient value less than 0.75 that year are designated "male-dominated." Those with values from 0.75 to 1.24 are in the "neutral" zone and are considered neither male- nor female-dominated. A coefficient of 1.25 or more indicates a "female-dominated" discipline.

By using coefficients, it is possible to trace changes in women's representation in specific disciplines over a period when there was an overall increase in the proportion of women among bachelor's degree graduates.

Trends over 15 years

Since the mid-1970s, Canada's universities have granted bachelor's degrees to an increasing number of students. From 1975 to 1990, the annual number of graduates rose 36% from approximately 81,000 to almost 110,000. Most of this growth can be attributed to women, whose ranks increased 71%, compared with an 8% gain for men. By 1990, 55.7% of all bachelor's degree graduates were women, compared with 44.4% in 1975 ([Table 1](#)).



Table 1 Female representation among bachelor's degree graduates, 1975 and 1990.

Source: University Student Information System database, Education, Culture and Tourism Division

This increase in women's share of bachelor's degrees was not evenly distributed throughout the various fields. During the period studied, women's educational choices shifted towards areas that have traditionally been male-dominated.

Discipline shifts

In 1975, 18 disciplines were male-dominated; by 1990, the influx of women into non-traditional fields of

study had reduced the number of male-dominated disciplines to 12 ([Chart A](#)).⁽²⁾



Chart A By 1990, the number of male-dominated disciplines had been reduced by one-third.

Source: University Student Information System database, Education, Culture and Tourism Division

For example, in 1975, women comprised 13.3% of commerce graduates; hence, their coefficient of representation was 0.30 (13.3 divided by 44.4). By 1990, 45.8% of commerce graduates were women, and the coefficient had increased to 0.82 (45.8 divided by 55.7). As a result, this once male-dominated discipline entered the neutral range.

The greatest change was in veterinary medicine, where the increase of female graduates was so large that their coefficient of representation rose from 0.47 in 1975 to 1.13 in 1990.

Increases of female graduates in several other disciplines also moved these fields out of the male-dominated category into the neutral zone. In addition to veterinary medicine and commerce, this was the case for zoology, law, medicine, and political science.

While some other disciplines remained male-dominated, an increasing proportion of female graduates means that they were approaching the neutral zone. By 1990, the coefficient of representation for women among agriculture graduates was 0.74, and among those receiving degrees in mathematics, 0.71. Coefficients were also relatively high in geography (0.68), chemistry (0.66), and dentistry (0.64).

Several other disciplines C engineering, physics, forestry, and computer science C were still male-dominated in 1990. These imbalances persisted despite substantial increases in the number of female graduates. Women's representation in these fields had been so low in 1975 that a doubling, tripling, or even tenfold increase in their numbers still left them under-represented among graduates. Computer science, in fact, actually became more male-dominated.

Patterns of change

Although women's representation rose in all but one male-dominated discipline (computer science), the pattern of change between 1975 and 1990 varied in different fields of study.

In some cases, the upturn in the proportion of female graduates was caused by a large increase in the number of women, combined with a smaller increase for men. This was the pattern in chemistry,

commerce, economics, engineering, mathematics, physics, and political science.

In other disciplines, the larger share of female graduates was attributable to a rising number of women and a decreasing number of men. Between 1975 and 1990, the increase of women in agriculture, architecture, dentistry, law, medicine, and veterinary medicine was such that the total number of graduates grew despite declines in the number of men. [\(3\)](#) By contrast, in forestry, geography, geology, and zoology, the increasing number of women earning degrees was insufficient to offset the decreasing number of men. Consequently, by 1990, these four disciplines produced fewer graduates than in 1975, although a higher percentage of them were women.

Computer science was the only male-dominated discipline in which the proportion of female graduates dropped between 1975 and 1990. While the number of women graduating from this discipline increased during the period, the number of male graduates rose at a faster pace.

Distribution of graduates

Women's entry into male-dominated fields of study has altered the overall distribution of female graduates among disciplines. While the majority of women still earn degrees in areas that have long been traditional choices, the proportion graduating from male-dominated fields has more than doubled. By 1990, the 18 male-dominated disciplines accounted for 27% of all female bachelor's degree graduates, up from 12% in 1975.

The most notable change was in commerce, which accounted for 10% of female graduates in 1990, compared with just 2% in 1975. And while relatively small shares (fewer than 3%) of female degree recipients graduated from any of the other male-dominated areas in 1990, in many cases, the proportions had at least doubled since 1975. Such increases occurred in architecture, dentistry, economics, engineering, forestry, geology, physics, political science, and veterinary medicine.

Top fields for women

From 1975 to 1990, there was also some change in the disciplines that attracted the largest proportions of women. Education ranked first in both years, although the percentage of all female graduates obtaining degrees in this field dropped from 27% to 19% ([Table 2](#)).



Table 2 Female bachelor's degree graduates, by top 10 disciplines, 1975 and 1990.

Commerce, with 10% of female graduates in 1990, had risen to second place. It was the only male-dominated discipline to rank in the top 10 fields of study for women in 1990.

Languages ranked third in 1990, down from second in 1975, as the proportion of all female graduates earning degrees in this area fell slightly from 10% to 9%. In 1990, psychology and sociology ranked fourth and fifth, whereas they had been third and fourth in 1975. However, both disciplines accounted for somewhat higher proportions of female graduates in 1990 than they had in 1975: 9% and 5% compared with 7% and 4%.

Conclusion

Between 1975 and 1990, women became the majority of bachelor's degree graduates. At the same time, female representation in almost all male-dominated disciplines increased, occasionally to the point where the discipline could no longer be considered "male-dominated." This growth generally came about because the rise in the number of women obtaining degrees outpaced that of their male counterparts. In some disciplines, however, higher female representation resulted from increases of women combined with decreases in the number of men.

The growing number of women with bachelor's degrees in male-dominated disciplines has several consequences. One of the most obvious is a larger pool of women qualified to pursue graduate studies in male-dominated fields of study.

As well, this shift in educational choices opens the door for women to enter professions in which they have traditionally been only a small minority. The availability of female graduates qualified for positions in areas such as the sciences and commerce might ultimately alter long-term employment patterns, which have historically concentrated women in a small group of occupations.

Data source

The Education, Culture and Tourism Division of Statistics Canada obtains graduation information from the administrative records of Canadian degree-granting institutions. The University Student Information System (USIS) database is created from these records. Information is collected on qualification counts for the calendar year ending in December. Graduation data refer to the number of degrees, diplomas and

certificates awarded, not the individual students who receive them. For instance, the same student may receive more than one degree in the same year. However, this is uncommon, so the difference between the number of degrees and the number of graduates is negligible.

Rising female representation at master's and doctoral levels

Unlike their undergraduate counterparts, women are still a minority in graduate programs. In 1990, 47% of master's and 32% of doctoral degrees were awarded to women. These proportions, however, were up from 28% and 16%, respectively, in 1975.

Women constitute a particularly small minority of graduate degree recipients in male-dominated disciplines. Nonetheless, since the mid-1970s, there has been a rise in the percentage of women among master's and doctoral degree graduates in such fields. In 1990, women earned 13% of master's and 6% of doctoral degrees in engineering, up from 4% at both levels in 1975. Similarly, by 1990, 12% of master's and 9% of doctoral graduates in physics were women, whereas in 1975, the corresponding figures had been 7% and 4%.

Notes

Note 1

This includes first professional degrees. Awarded at the undergraduate level, these degrees differ from bachelor's degrees in that they require a prior degree and/or a professional licence to practice a profession. The program may also contain practical elements not normally found in bachelor's programs. These degrees include: law (LLB), medicine (MD), veterinary medicine (DVM), dentistry (DDS, DMD), and education (B.Ed., requiring a prior bachelor's degree).

Note 2

Figures include foreign students as well as Canadian citizens. The proportion of men among foreign students tends to be relatively high.

Note 3

The declining number of men in these fields, particularly professions such as law and medicine, may not indicate less interest on the part of men so much as the institutions' lack of capacity to increase enrolment

beyond a given level.

References

- Hughes, K.D. "[Trading places: men and women in non-traditional occupations, 1971-86,](#)" *Perspectives on labour and income*, Quarterly, Catalogue 75-001E, Summer 1990. Ottawa: Statistics Canada, pp. 58-68.
 - Statistics Canada. *Universities: enrolment and degrees*, Annual, Catalogue 81-204, Ottawa, various editions 1975-1990.
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Source

Perspectives on Labour and Income, Winter 1992, Vol. 4, No. 4 (Statistics Canada, Catalogue 75-001E). This is the second of six articles in the issue.



Table 1

Female representation among bachelor's degree graduates, 1975 and 1990

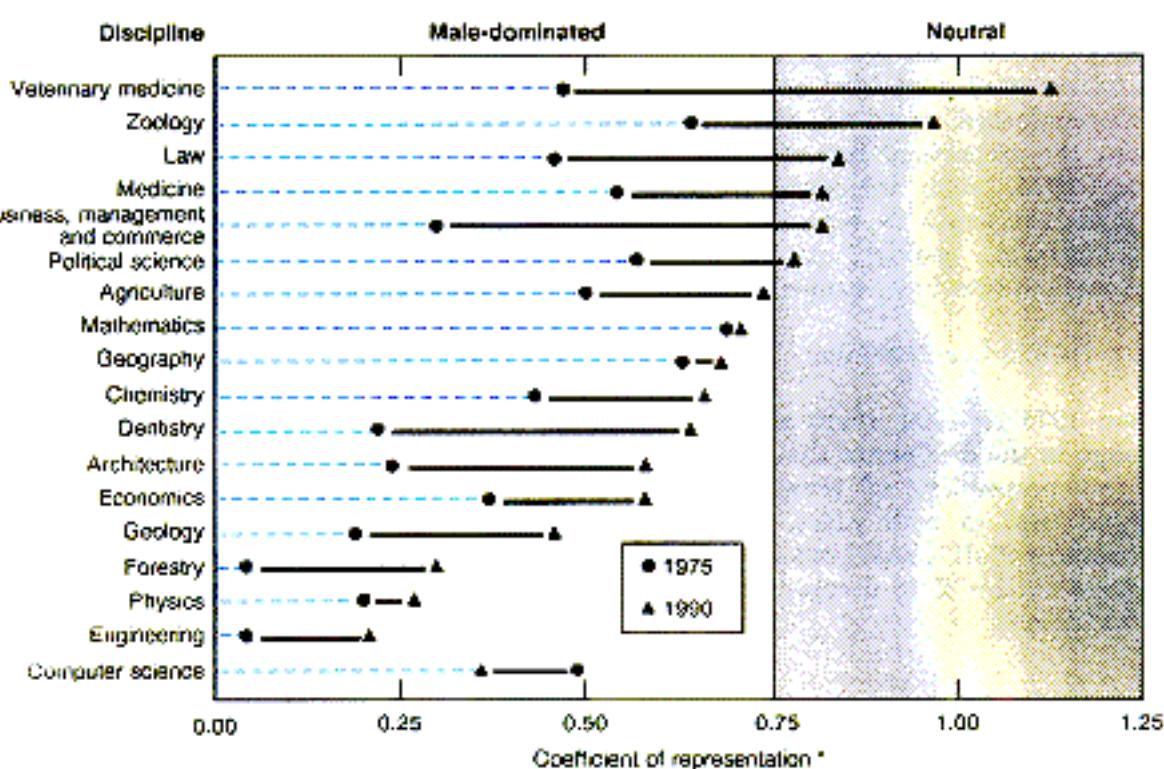
	Graduates		Proportion of women	
	1975	1990	1975	1990
	Number	%		
All graduates	80,754	109,812	44.4	55.7
Total male-dominated disciplines*	25,921	44,926	16.8	36.1
Veterinary medicine	200	287	21.0	63.1
Zoology	496	329	28.2	54.1
Law	2,670	3,362	20.8	47.2
Medicine	2,011	2,290	23.9	45.9
Business, management and commerce	5,328	13,819	13.3	45.8
Political science	1,581	3,637	25.4	43.7
Agriculture	533	646	22.0	41.3
Mathematics	1,554	2,064	30.8	39.7
Geography	1,955	1,744	28.0	37.7
Chemistry	746	987	19.3	36.7
Dentistry	456	495	9.6	35.8
Architecture	475	547	10.7	32.5
Economics	1,835	4,202	16.6	32.5
Geology	531	374	8.5	25.9
Computer science	799	2,194	21.9	19.8
Forestry	256	243	1.6	16.5
Physics	417	650	8.9	15.1
Engineering	4,078	7,056	1.8	11.7
Other disciplines	54,833	64,886	57.4	69.1

Source: University Student Information System database, Education, Culture and Tourism Division

* As defined in 1975.

Chart A

By 1990, the number of male-dominated disciplines had been reduced by one-third.



Source: University Student Information System database, Education, Culture and Tourism Division

* See explanation in text.

Table 2

Female bachelor's degree graduates, by top 10 disciplines, 1975 and 1990

Rank	Discipline	1975		1990	
		Female graduates		Female graduates	
		Number	Distribution	Number	Distribution
	All female graduates	35,850	100.0	All female graduates	61,154
1	Education	9,796	27.3	Education	11,289
2	Languages	3,633	10.1	Business/commerce**	6,330
3	Psychology	2,596	7.2	Languages	5,428
4	Sociology	1,364	3.9	Psychology	5,389
5	Fine and applied arts	1,336	3.7	Sociology	3,058
6	Nursing	1,284	3.6	Nursing	2,492
7	Physical education	1,107	3.1	Fine and applied arts	2,353
8	Household science*	1,031	2.9	Biology	2,051
9	History*	994	2.8	Physical education	1,670
10	Biology	894	2.5	Social work**	1,455
	Total top 10	24,035	67.1	Total top 10	41,515
	Other disciplines	11,815	32.9	Other disciplines	19,639

Source: University Student Information System database, Education, Culture and Tourism Division

* Top 10 in 1975, not in 1990.

** Top 10 in 1990, not in 1975.