Women in Science and Engineering in Canada

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Executive Summary

The under-representation of women[1] in the various fields of science and engineering has long been recognized as an important issue for the Natural Sciences and Engineering Research Council of Canada (NSERC). In this third instalment in the series on *Women in Science and Engineering in Canada*, a review of some of the available statistics on women in the natural sciences and engineering (NSE) is presented.

Section 2 of this report summarizes standardized test results in mathematics and science and examines the supply side of women in science and engineering through the education stream and immigration. A number of national and international groups assess the performance of boys and girls through standardized tests of mathematics and science. Canadian boys and girls being assessed at various grade levels tend to perform equally well, and, when statistically significant differences exist, they are typically small.

The number of girls taking exams or obtaining credits in grade 12/secondary 5 and/or cégep (Quebec colleges) in mathematics, science, biology, physics and chemistry is higher than the number of boys by a small margin (51 per cent) from 2009–10 to 2013–14. However, this ratio does not hold for young Canadians entering university in NSE disciplines, where the female-to-male distribution at the bachelor's level is 38 per cent to 62 per cent (2014–15). The table below highlights the trends in NSE university enrolments and degrees awarded. For more than two decades now, the number of women enrolled or obtaining degrees in the NSE has grown significantly. While the percentage of women enrolled or obtaining degrees in the NSE has progressed since the early 1990s, recent trends have been flat.

Trends in Female University Enrolments and Degrees Granted in the Natural Sciences and Engineering in Canada

	% Female				Number of Females			
Level	**1992**	**1999**	**2007**	**2014**	**1992**	**1999**	**2007**	**2014**
Enrolment								
Bachelor's	32.1	37.5	38.6	38.0	31,563	42,933	57,033	70,329
Master's	29.4	38.7	37.5	36.5	3,806	5,706	7,908	9,768
Doctoral	20.9	29.5	30.9	31.8	2,107	2,958	5,214	7,302
Degrees								
Bachelor's	31.6	38.3	40.6	38.7	6,626	9,978	13,632	13,272
Master's	27.4	36.3	36.2	35.9	1,233	1,815	2,817	3,918
Doctoral	20.2	22.9	31.3	31.3	330	471	762	1,101

Source: Statistics Canada

[1] In this report, *women* or *girls* generally refer to people who self-identify as women. However, in the statistics used and cited throughtout, *women* or *female* refer to biological sex rather than self-identified sex, as the statistics were gathered on this basis.

Section 3 examines the career outcomes for women for occupations related to science or engineering, with particular emphasis on academic and research careers.

The table below presents data for a number of career outcomes for women in the NSE. In general, there are significantly more women in NSE-related occupations over the years, and women hold an increasing share of the occupations examined.

Trends in Labour Participation by Females in the Natural Sciences and Engineering in Canada

	% Female					Number of Females				
Occupation	**1995**	**2000**	**2005**	**2010**	**2015**	**1995**	**2000**	**2005**	**2010**	**2015**
General										
NSE-Related Occupations	19.2	20.9	20.7	21.8	23.1	138,000	205,000	228,000	266,000	325,000
R&D Careers										
University Faculty	11.5	12.5	15.9	18.3	n/a	1,172	1,203	1,755	2,223	n/a
Government Scientists	10.7	13.9	17.2	20.1	23.7	285	312	421	500	476
Industry Researchers	n/a	n/a	21.1*	n/a	n/a	n/a	n/a	1,190	n/a	n/a

Source: Statistics Canada

n/a: not applicable

*: Industry research percentage is for 2003.

Section 4 presents an overview of NSERC statistics by sex. The share of NSERC awards given to women typically reflects the distribution of the eligible population. Competition success rates by sex for various NSERC programs are also, on average, equivalent for both sexes. The table below presents data on the share and number of awards held by females for a selected number of NSERC programs.

Trends in Support for Females in Selected NSERC Programs

	% Female					Number of Females				
Program	**1995-96**	**2000-01**	**2005-06**	**2010-11**	**2015-16**	**1995-96**	**2000-01**	**2005-06**	**2010-11**	**2015-16**
Discovery Grants	9.3	13.4	15.6	17.7	19.9	646	1,082	1,467	1,720	1,861
Postgraduate Scholarships	34.0	40.5	42.8	40.0	38.9	1,065	1,220	1,691	1,751	1,154
Postdoctoral Fellowships	17.3	26.1	27.8	31.2	29.4	78	121	145	162	106
Undergraduate Student Research Awards	44.4	46.6	45.0	40.7	43.4	592	1,412	1,870	1,586	1,184

Source: Statistics Canada

While progress has been made in the representation of women in the NSE in universities and in related careers, more attention to improving the situation is still required.

1. Introduction

The under-representation of women in the various fields of natural sciences and engineering (NSE) has long been recognized and is of concern to the Natural Sciences and Engineering Research Council of Canada (NSERC). This report presents a review and analysis of some of the available data by sex on Canadians' participation in science and engineering. From pre-university to post-graduation, the participation of girls and women and of boys and men in science and engineering education and careers is highlighted.

Canadians on the whole are highly educated and skilled. Top experts and leaders are staying in Canada, talented people are coming to Canada to study and work, and skilled and educated youth are entering the workforce.[2] Despite these achievements, women graduating in science, technology, engineering and mathematics (STEM) fields such as physical sciences, computer science, engineering, and mathematics are still a minority. The proportion of women in academic or industrial STEM-related careers reflects this under-representation among students, particularly when correlated with the proportion of women with advanced degrees. A robust and vibrant science, technology and innovation ecosystem[3] is critical to Canada's economic prosperity and high quality of life. Science, technology and innovation drive productivity and competitiveness, and generate solutions to health, environmental and societal challenges, which lead to higher living standards and better quality of life. The need to foster the participation of women in science and engineering also arises from growing concerns, such as:

- the shortage of some STEM skills needed for building and maintaining an innovative base,
- the low appeal of science education for a majority of young Canadians, and
- an aging population, as well as retirement of many experienced STEM workers.

This report tracks women's participation in science and engineering in Canada over a 10-year time period. NSERC data up to 2016 are included (where data are available). The report builds on the previous NSERC' report *Women in Science and Engineering in Canada — 2010*. The data provide insight into the magnitude of the problems along the educational pathway and in the science and engineering workforce, with a focus on research careers and funding in the NSE.

[2] Industry Canada, *Seizing Canada's Moment: Moving Forward in Science, Technology and Innovation 2014*, Ottawa (ON), 2014.

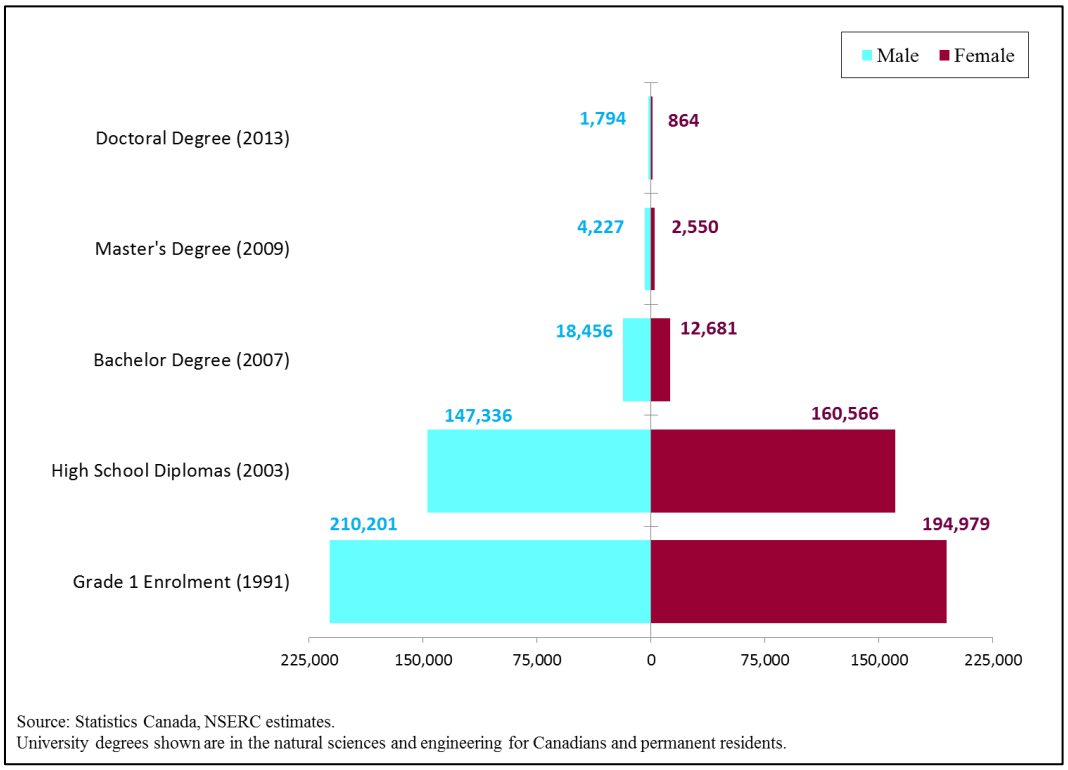
[3] Science, Technology and Innovation Council (STIC), *State of the Nation 2014—Canada's Science, Technology and Innovation System: Canada's Innovation Challenges and Opportunities*, Ottawa (ON), 2015, p. 5.

2. Student Discipline Selection and Performance

2.1 Elementary School to University

The production of university graduates in science and engineering begins early on, in elementary school, when children are exposed to and form opinions about mathematics and science. Figure 2.1 presents an approximate cohort analysis of the progression of students from grade 1 to a PhD in the sciences or engineering by sex in Canada. At each step along the education stream, fewer and fewer young people choose to study science or engineering, and the drop-off for girls and women is considerably larger than that for boys and men. The likelihood of a girl enrolled in grade 1 in Canada going on to receive a PhD in the sciences or engineering is approximately 1 in 225 (the odds for a boy are 1 in 117).

Figure 2.1 The Canadian Science and Engineering Supply Chain



Source: Statistics Canada, NSERC estimates.
University degrees shown are in the natural sciences and engineering for Canadians and permanent residents.

Interest in math and science education has spawned a number of international assessments, primarily to gauge students' knowledge of these subjects, but also to learn students' perceptions and attitudes toward studying these subjects. While the international assessments provide a global measure of

whether all children are learning the basics, national assessments complement this measure by monitoring progress within countries towards achieving a wider set of learning outcomes.[4]

Standardized Test Results by Sex

In Canada, a program of national standardized tests of reading, math and science skills, the Pan-Canadian Assessment Program (PCAP), is administered every three years to grade 8 students in Canadian provinces and territories. The program was initiated by the Council of Ministers of Education, Canada in 2003, to reflect changes made to the curriculum. Before the PCAP was implemented, a School Achievement Indicators Program (SAIP) had been in place from 1993 to 2004, to assess the performance of 13- and 16-year-old students.

For each administration of PCAP, one of the three domains (reading, math and science) is designated as major and the other two as minor. The major domain has a larger number of assessment items, which enables the reporting of results for subdomains; only overall results are reported for the minor domains. The assessment also includes information on the contexts in which mathematics, reading and writing, and science education take place in Canada's education systems. The context information is collected through questionnaires completed by students, teachers and school principals. Students respond to questions concerning their learning environment and the importance they ascribe to the subject being tested.[5]

At the international level, Canada participates in three studies: Progress in International Reading Literacy Study (PIRLS), Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS). Table 2.1 gives an overview of these programs. It should be noted that all of Canada participated in TIMSS in 1995 and 1999. In 2003, only Ontario and Quebec participated (as benchmarking participants), while in 2007 these two provinces were joined by Alberta and British Columbia. These international assessments enable Canada to benchmark its performance against other countries. Since each of these studies is designed to serve a different purpose, the results should be considered as different lenses through which to view and better understand students' performance.

[4] UNESCO, *Enhancing Student Performance in Programme for International Assessment (PISA) in the Gulf Cooperation Council States (GCC) for Improved Learning Outcomes*, Doha Conference Report, Qatar, 4–5 March 2015, p. 2.

[5] *Pan-Canadian Assessment Program (PCAP);* available at http://www.cmec.ca/240/Programs-and Initiatives/Assessment/Pan-Canadian-Assessment-Program- (PCAP)/Overview/index.html.

Table 2.1 Major International and National Learning Assessment Studies[6]

	International			National
Assessment	**PISA**	**TIMMS**	**PIRLS**	**PCAP[7]**
Full Name	Program for International Student Assessment	Trends in International Mathematics and Science Study	Progress in International Reading Literacy Study	Pan-Canadian Assessment Program
Disciplines Assessed	Reading, mathematics, science, problem solving	Mathematics and science	Reading	Reading, mathematics and science
Target Population	15-year-old students	Grades 4 and 8 students	Grade 4 students	Grade 8 students
Frequency	3-year cycle	4-year cycle	5-year cycle	3-year cycle
Assessment Period (Major Discipline)	2000 (Reading) 2003 (Mathematics) 2006 (Science) 2009 (Reading) 2012 (Mathematics) 2015 (Science)	1995, 1999, 2003, 2007, 2011, 2015	2001, 2006, 2011, 2016	2007 (Reading) 2010 (Mathematics) 2013 (Science) 2016 (Reading)
Purpose	• Evaluates education systems by assessing to what extent students at the end of compulsory education can apply their knowledge to real-life situations and be equipped for society. Both subject matter content and the capacity of individuals to apply that knowledge creatively are assessed. • Also assesses students' attitudes toward math, science and reading.	• Measures trends in mathematics and science achievement at grades 4 and 8. • Structures questions with a "content domain" and a "cognitive domain" (knowing, applying and reasoning). • Describes educational context, including home support, students' attitudes, curriculum, teachers' training, and classroom activities.	• Measures trends in reading comprehension. • Investigates the experiences young children have at home and school in learning to read.	• Determines whether students across Canada reach similar levels of performance in the core disciplines at about the same age. • Complements existing jurisdictional assessments with comparative Canada-wide data on the achievement levels attained by Grade 8 students across the country.
Focus	Skills-based	Curriculum-based	Curriculum-based	Curriculum-based

[6] Cambridge International Examinations, *International Surveys: PISA, TIMMS, PIRLS*, Education Brief (7), November 2015, available at http://www.cie.org.uk/images/271193-international-surveys-pisa-timss-pirls.pdf.

[7] K. O'Grady, and K. Houme, *Pan-Canadian Assessment of Science, Reading and Mathematics, PCAP 2013*, Council of Ministers of Education, Canada, Toronto (ON), 2014.

Table 2.1 Major International and National Learning Assessment Studies—continued

	International			National
Assessment	**PISA**	**TIMMS**	**PIRLS**	**PCAP**
Supplementary Information	Background information obtained from learners in a questionnaire. Focuses on characteristics of learners, attitudes to subjects, motivation and learning strategies.	Background information obtained from learners in a questionnaire. Information also collected about teachers, activities of schools and teachers' classroom behaviour.	Background information obtained from learners in a questionnaire. Information also collected about teachers, activities of schools and teachers' classroom behaviour	Contextual data: – Student Questionnaire – School Questionnaire – Teacher Questionnaire
Organization	Organisation for Economic Cooperation and Development (OECD)	International Association for the Evaluation of Educational Achievement (IEA)	International Association for the Evaluation of Educational Achievement (IEA)	Council of Ministers of Education, Canada (CMEC)
Participants	65 countries and economies in 2012	66 countries and 14 sub-national entities in 2011	55 countries and 7 sub-national entities in 2011	All provinces and one of the territories
Number of Learners Assessed	More than 5,000 learners in each country/jurisdiction	At least 4,000 learners in each country/jurisdiction	About 3,500–4,000 learners in each country/jurisdiction	About 32,000 learners for 2013
Development Process	Developed by the international experts and PISA Consortium test developers. Test items reviewed by country representatives for cultural bias and relevance to PISA's goals.	TIMSS Science and Math Item Review committee and national research coordinators from participating countries develop frameworks through an iterative process.	PIRLS Reading Development Group and national research coordinators from participating countries update frameworks for each PIRLS administration and reviews test items for cultural bias.	• Frameworks developed by representatives from English & French language education systems. • Frameworks reviewed and accepted by all participating jurisdictions as the basis for developing test items.

Performance in Mathematics

The test score results in Table 2.2 show that boys tend to have slightly higher scores than girls in some provinces and some grades, both at the level of formal mathematical knowledge (TIMSS-based results) and at the level of applied mathematics (PISA-based results). PISA results from 2003 to 2012 show statistically small significant differences between the performance of 15-year-old boys and girls in Canada, with the gap being relatively stable over the years.

Both TIMSS-grade 8 and PISA results show that the Canadian scores in mathematics since 2003 (the baseline year when mathematics was the major domain of PISA-2003 study) have declined for both boys and girls, while TIMSS-grade 4 performance has been improving. The national PCAP assessment shows that mathematics achievement in grade 8 has improved slightly in Canada from 2010 (when mathematics was the major domain) to 2013.

The latest PCAP results (PCAP 2013) show that boys and girls in grade 8 had similar performance overall in Canada. This is consistent with the grade 8 results of the three benchmarking provinces that participated in TIMSS 2011. On the other hand, the Canadian results for 15-year-old students reported in the latest PISA study (2012) still indicate a small difference, with boys scoring slightly higher than girls. While TIMSS assessment is curriculum-based and focuses on assessing formal mathematical knowledge, PISA is skills-based, and emphasizes the application of mathematics in the real world. Although there are differences between the mathematics frameworks of these assessments, a comparison of results of these two studies serves to highlight that gender differences are not straightforward and that deeper exploration is required in order to identify strategies to promote learning equity.[8]

PISA also surveyed students' self-beliefs and participation in mathematics-related activities as well as their drive and motivation toward the discipline. These measurements are made at an important and formative time of an adolescent's life and can provide some insight into the patterns of behaviour that may develop.[9] In addition to the difference in mathematics performance, there were marked differences (Table 2.3 and 2.4) between males and females in their level of interest in and enjoyment of mathematics as well in their self-related beliefs and emotions in relation to mathematics. The following is an extract from the report of the Canadian results (PISA 2003), which summarizes those findings:

> Students' mathematics confidence, their perceived abilities in mathematics, and their beliefs in the value of mathematics for future work and education may have an important impact on their course selections, educational pathways and career choices. Differences exist between the mathematics engagement of Canadian boys and girls. For example, after controlling for mathematics performance, girls reported lower levels of confidence in their ability to solve specific mathematical problems, lower levels of their perceived ability to learn mathematics and higher levels of anxiety in dealing with mathematics. Girls were also less likely to believe that mathematics will be useful for

[8] Ibid., p. 57.

[9] Organisation for Economic Cooperation and Development, *Equally Prepared for Life? How 15-year-old Boys and Girls Perform in School*, 2009, p. 15.

their future employment and education and were more likely to report lower levels of interest and enjoyment in mathematics.[10]

[10] P. Bussière, F. Cartwright, and T. Knighton, *Measuring up: Canadian Results of the OECD PISA Study—The Performance of Canada's Youth in Mathematics, Reading, Science and Problem Solving—2003 First Findings for Canadians Aged 15*, Statistics Canada, Ottawa (ON), Catalogue no. 81-590-XPE, 2004, p. 47.

Table 2.2 Various Mathematics Test Results by Sex

Program	Year	Location	Grade/Age	Males Average Score	Females Average Score	Statistically Different Yes (Y) No (N)
PCAP	2013	Canada	Grade 8	507	507	N
	2010			504	499	N
	2007			501	501	N
TIMSS	2011	Alberta	Grade 4	511	502	Y
		Ontario		521	515	Y
		Quebec		538	527	Y
		Alberta	Grade 8	506	504	N
		Ontario		512	512	
		Quebec		532	531	N
TIMSS	2007	BC	Grade 4	508	502	Y
		Alberta		510	500	Y
		Ontario		514	509	N
		Quebec		524	515	Y
		Ontario	Grade 8	522	513	Y
		Quebec		529	527	N
TIMMS	2003	Ontario	Grade 4	517	505	Y
		Quebec		509	502	Y
		Ontario	Grade 8	522	520	N
		Quebec		546	540	Y
TIMSS	1999	Alberta	Grade 8	535	528	Y
		Ontario		519	514	Y
		Quebec		566	565	N
TIMSS	1995	Alberta	Grade 4	524	523	N
		Ontario		491	487	N
		Quebec		552	548	N
		Alberta	Grade 8	529	526	N
		Ontario		504	499	N
		Quebec		560	553	N
PISA	2012	Canada	15-year-olds	523	513	Y
	2009			533	521	Y
	2006			534	520	Y
	2003			541	530	Y
	2000			539	529	Y

Table 2.3 Canadian 15-Year-Old Boys' and Girls' Self-Beliefs and Engagement in Relation to Math—PISA 2012[11]

Area	Statements	Boys (%)	SE*	Girls (%)	SE*	Sex % difference	SE*
Students' self-concept in mathematics	I am just not good at mathematics [b]	69.4	(0.9)	57.5	(1.0)	11.8	(1.2)
	I get good grades in mathematics [a]	69.4	(0.9)	63.3	(1.0)	6.0	(1.3)
	I learn mathematics quickly [a]	65.5	(0.9)	51.5	(1.0)	13.9	(1.2)
	I have always believed that mathematics is one of my best subjects [a]	51.8	(0.9)	36.8	(0.9)	15.0	(1.1)
	In my mathematics class, I understand even the most difficult work [a]	54.6	(0.9)	38.5	(1.1)	16.1	(1.4)
Students and mathematics anxiety	I often worry that it will be difficult for me in mathematics classes[a]	52.1	(0.9)	66.9	(1.0)	-14.7	(1.2)
	I get very tense when I have to do mathematics homework[a]	34.3	(0.8)	41.6	(1.0)	-7.3	(1.1)
	I get very nervous doing mathematics problems[a]	25.0	(0.7)	36.7	(1.0)	-11.7	(1.1)
	I feel helpless when doing a mathematics problem[a]	20.9	(0.7)	31.0	(0.9)	-10.0	(1.0)
	I worry that I will get poor grades in mathematics[a]	54.0	(0.8)	68.3	(0.9)	-14.3	(1.1)
Students and mathematics behaviours (% of students who reported doing the following activities "always or almost always" or "often")	I talk about mathematics problems with my friends	17.6	(0.8)	17.2	(0.7)	0.5	(1.0)
	I help my friends with mathematics	30.8	(0.9)	30.3	(0.8)	0.5	(1.1)
	I do mathematics as an extracurricular activity	8.2	(0.6)	4.7	(0.4)	3.5	(0.7)
	I take part in mathematics competitions	7.0	(0.5)	3.1	(0.3)	4.0	(0.6)
	I do mathematics more than two hours a day outside of school	8.4	(0.5)	8.5	(0.6)	-0.2	(0.7)
	I play chess	21.5	(0.7)	6.9	(0.5)	14.5	(0.9)
	I programme computers	21.3	(0.8)	6.8	(0.5)	14.5	(0.9)
	I participate in a mathematics club	2.8	(0.3)	1.0	(0.2)	1.8	(0.4)

[a] Percentage of students who reported "agree" or "strongly agree."
[b] Percentage of students who reported "disagree" or "strongly disagree."
SE: standard error

[11] Organisation for Economic Cooperation and Development, *PISA 2012 Results: Ready to Learn:Students' Engagement, Drive and Self-Beliefs (Volume III)*, 2013, Annex B1, StatLink, available at: http://dx.doi.org/10.1787/888932963958.

Table 2.4 Canadian 15-Year-Old Boys' and Girls' Drive and Motivation Toward Math—PISA 2012[11]

Area	Statements	Boys (%)	SE*	Girls (%)	SE*	Sex % difference	SE*
Students' openness to problem solving	I can handle a lot of information	60.6	(0.9)	53.7	(0.9)	6.9	(1.2)
	I am quick to understand things	65.5	(0.9)	57.4	(0.8)	8.0	(1.2)
	I seek explanations for things	63.8	(0.9)	65.4	(0.9)	-1.7	(1.1)
	I can easily link facts together	65.5	(0.9)	55.4	(1.0)	10.0	(1.3)
	I like to solve complex problems	44.1	(0.9)	30.4	(0.8)	13.6	(1.1)
Students' self-responsibility for failing in mathematics	I'm not very good at solving mathematics problems	43.9	(1.0)	56.4	(0.9)	12.5	n/a
	My teacher did not explain the concepts well this week	43.6	(0.9)	48.3	(1.0)	4.7	n/a
	This week I made bad guesses on the quiz	44.7	(0.8)	47.1	(0.8)	2.4	n/a
	Sometimes the course material is too hard	51.6	(1.0)	64.1	(0.9)	12.6	n/a
	The teacher did not get students interested in the material	53.3	(1.0)	50.2	(1.0)	-3.1	n/a
	Sometimes I am just unlucky	38.8	(0.9)	34.7	(0.8)	-4.1	n/a
Students' intrinsic motivation to learn mathematics	I enjoy reading about mathematics	40.6	(0.8)	28.8	(0.7)	11.8	(1.1)
	I look forward to my mathematics lessons	42.9	(0.9)	36.5	(0.8)	6.4	(1.2)
	I do mathematics because I enjoy it	39.2	(0.8)	34.0	(0.8)	5.1	(1.2)
	I am interested in the things I learn in mathematics	58.5	(0.8)	49.2	(0.9)	9.3	(1.3)
Students' instrumental motivation to learn mathematics	Making an effort in mathematics is worth it because it will help me in the work that I want to do later on	83.6	(0.8)	80.8	(0.8)	2.8	(1.1)
	Learning mathematics is worthwhile for me because it will improve my career prospects and chances	86.9	(0.6)	84.6	(0.7)	2.3	(1.0)
	Mathematics is an important subject for me because I need it for what I want to study later on	77.5	(0.8)	69.2	(1.0)	8.2	(1.4)
	I will learn many things in mathematics that will help me get a job	81.2	(0.7)	76.8	(0.8)	4.4	(1.1)

SE: standard error

[11] Organisation for Economic Cooperation and Development, *PISA 2012 Results: Ready to Learn:Students' Engagement, Drive and Self-Beliefs (Volume III)*, 2013, Annex B1, StatLink, available at: http://dx.doi.org/10.1787/888932963958.

Performance in Science

Trends in test score results in science (Table 2.5) indicate that, in the national test (PCAP), grade 8 girls have had slightly higher scores than boys throughout the last three studies. In the TIMSS study, boys were more likely to score slightly higher than girls in grade 8 as compared with grade 4. PISA overall results for science indicate smaller differences in performance between boys and girls as compared with mathematics results.

To gain insight into differences in science performance of 15-year-old boys and girls, the PISA 2006 study, in which science was the major domain, was used. In addition to reporting on combined science performance, PISA 2006 also reported on the following three scientific competencies:

- identifying scientific issues,
- explaining phenomena scientifically, and
- using scientific evidence.

Detailed results of the 2006 PISA assessment indicate that boys and girls performed differently in different areas of science (Table 2.6). Boys had higher scores on scientific knowledge, whereas girls scored higher on the competency of identifying scientific questions that arise from a given situation. In the area of knowledge, boys tended to score higher than girls in the areas of "physical systems" and "earth and space systems." The area of "living systems," however, showed few significant differences in the scores for girls and boys.

PISA 2015 was the second round of the assessment in which science performance was studied in detail; the report, recently released in December 2016 indicates that, in science overall, there was no difference in average achievement scores between 15-year-old boys and girls in Canada.

The level of student engagement is important for acquiring skills and knowledge in science. Students who are engaged in the learning process will tend to learn more and be more receptive to the pursuit of knowledge. Furthermore, student engagement in science has an impact on course selection, educational pathways and career choices.[12] Based on student responses to a series of questions, PISA 2006 constructed a number of engagement indices. The levels of engagement show that differences exist in the attitudes, confidence and motivation of boys and girls toward science (Table 2.7).

[12] P. Bussière, T. Knighton, and D. Pennock, *Measuring up: Canadian Results of the OECD PISA Study—The Performance of Canada's Youth in Science, Reading,Science and Mathematics—2006 First Results for Canadians Aged 15*, Statistics Canada, Ottawa (ON), Catalogue no. 81-590-XIE, 2007, p. 44.

Table 2.5 Various Science Test Results by Sex

Program	Year	Location	Grade/Age	Males Average Score	Females Average Score	Statistically Different Yes (Y) No (N)
PCAP	2013	Canada	Grade 8	499	501	N
	2010			496	507	Y
	2007			500	502	N
TIMSS	2011	Alberta	Grade 4	545	537	Y
		Ontario		530	525	N
		Quebec		520	512	Y
		Alberta	Grade 8	549	542	Y
		Ontario		522	521	N
		Quebec		522	518	N
TIMSS	2007	B.C.	Grade 4	536	538	N
		Alberta		545	540	N
		Ontario		539	532	N
		Quebec		518	516	N
		Ontario	Grade 8	531	521	Y
		Quebec		511	503	N
TIMMS	2003	Ontario	Grade 4	543	537	N
		Quebec		501	500	N
		Ontario	Grade 8	540	526	Y
		Quebec		540	522	Y
TIMSS	1999	Alberta	Grade 8	569	528	Y
		Ontario		527	509	Y
		Quebec		545	536	N
TIMSS	1995	Alberta	Grade 4	558	552	N
		Ontario		518	513	N
		Quebec		532	524	N
		Alberta	Grade 8	559	540	Y
		Ontario		506	488	Y
		Quebec		514	506	N
PISA	2015	Canada	15-year-olds	528	527	N
	2012			527	524	N
	2009			531	526	Y
	2006			536	532	N
	2003			527	516	Y
	2000			529	531	Y

Table 2.6 Canadian 15-Year-Old Boys' and Girls' Performance on the Science Sub-Scale—PISA 2006[13]

Scientific Competencies and Knowledge Assessed in PISA 2006	Males		Females			
	Mean score	SE	Mean score	SE	Sex diff.	SE
Identifying scientific issues: • Recognizing issues that are possible to investigate scientifically • Identifying keywords to search for scientific information • Recognizing the key features of a scientific investigation	525	(2.7)	539	(2.4)	**-14**	(2.4)
Explaining phenomena scientifically: • Applying knowledge of science in a given situation • Describing or interpreting phenomena scientifically and predicting changes • Identifying appropriate descriptions, explanations and predictions	539	(2.6)	522	(2.3)	**17**	(2.5)
Using scientific evidence: • Interpreting scientific evidence and making and communicating conclusions • Identifying the assumptions, evidence and reasoning behind conclusions • Reflecting on the societal implications of science and technological developments	541	(2.7)	542	(2.3)	-1	(2.3)
Knowledge about science: The processes of science as a form of enquiry	534	(2.5)	541	(2.1)	**-7**	(2.3)
Knowledge of earth and space systems: focuses on structure and energy of the Earth systems, changes in Earth systems, the Earth's history and its place in space	549	(2.4)	531	(1.9)	**18**	(2.3)
Knowledge of living systems: refers to cell structure, human biology, the nature of populations and ecosystems, and the biosphere	534	(2.6)	527	(2.3)	**8**	(2.5)
Knowledge of physical systems: refers to structure and properties of matter, chemical changes of matter, motions and forces, energy transformations, and interactions of energy and matter	543	(2.4)	514	(2.0)	**29**	(2.4)

Note: Data in bold represents statistically significant difference.

SE = standard error

[13] Organisation for Economic Cooperation and Development, *PISA 2006 Results: Science Competencies for Tomorrow's World, Volume 2: Data*, 2007, StatLink available at: http://dx.doi.org/10.1787/142056138443.

Table 2.7 Canadian 15-Year-Old Boys' and Girls' Engagement in and Motivation Toward Science—PISA 2006[14]

Indicators of students' engagement in science	Males		Females		Sex difference (M – F)	
	Mean index	SE	Mean index	SE	Difference	SE
Self-efficacy in science: measures confidence to perform science-related tasks	0.30	(0.02)	0.13	(0.02)	**0.17**	(0.02)
Self-concept in science: measures their perception of their ability to learn science	0.42	(0.02)	0.12	(0.02)	**0.30**	(0.03)
General value of science: measures their general appreciation of science as important and valuable to society at large	0.21	(0.02)	0.07	(0.01)	**0.14**	(0.02)
Personal value of science: measures their appreciation of science as being relevant and useful for their own purposes	0.23	(0.02)	0.16	(0.02)	**0.07**	(0.02)
General interest in science: refers to interest in learning about broad science topics	0.10	(0.02)	0.12	(0.01)	-0.02	(0.02)
Enjoyment of science: measures enjoyment in learning and reading about science, solving science problems and acquiring new knowledge in science	0.22	(0.02)	0.13	(0.02)	**0.09**	(0.02)
Instrumental motivation to learn science: measures their belief that science will be useful for future employment or education	0.28	(0.02)	0.36	(0.02)	**-0.08**	(0.03)
Future-oriented motivation to learn science: measures their belief that they will study and work in the field of science as an adult	0.22	(0.02)	0.19	(0.02)	0.03	(0.02)
Students' science-related activities: measures the extent to which they participate in activities outside of school	-0.05	(0.02)	-0.25	(0.02)	**0.19**	(0.03)

Note: Data in bold represent statistically significant difference.
Indices were derived based on questions collected through the students' questionnaires. Each index was constructed so that the average score across the OECD countries is 0 and so that two-thirds of the scores are between -1.0 and 1.0 (i.e., a standard deviation of 1). Positive scores on each index are associated with higher levels of attributes being measured, whereas negative scores are associated with lower levels of the attributes being measured.

[14] Organisation for Economic Cooperation and Development, *PISA 2006 Results: Science Competencies for Tomorrow's World, Volume 2: Data*, 2007, StatLink available at: http://dx.doi.org/10.1787/142102278412.

Secondary School and Cégep Preparedness for University STEM Eligibility

In an attempt to better understand the path students take toward a university education in science or engineering, the number of grade 12 students (including students in secondary 5 and cégep in Quebec) enrolled, or writing provincial exams in science and mathematics for selected provinces, is provided in Table 2.8. These data are depicted in Figure 2.2 and indicate that female students outnumber males in biology, are nearly equally represented in mathematics and chemistry, but are fewer than males in physics. This pattern repeats itself upstream in undergraduate enrolment for the biological sciences and physics, but the high number of females at the high school level in chemistry and mathematics does not translate into similar participation at the undergraduate level. While the overall distribution by sex of science and mathematics students pre-university is nearly equal, at the undergraduate level the distribution by sex is 62 per cent male versus 38 per cent female (2014 data) .

Figure 2.2 Number of Students Enrolled, or Writing Provincial Exams for Grade 12, Secondary 5 and Cégep, 2013

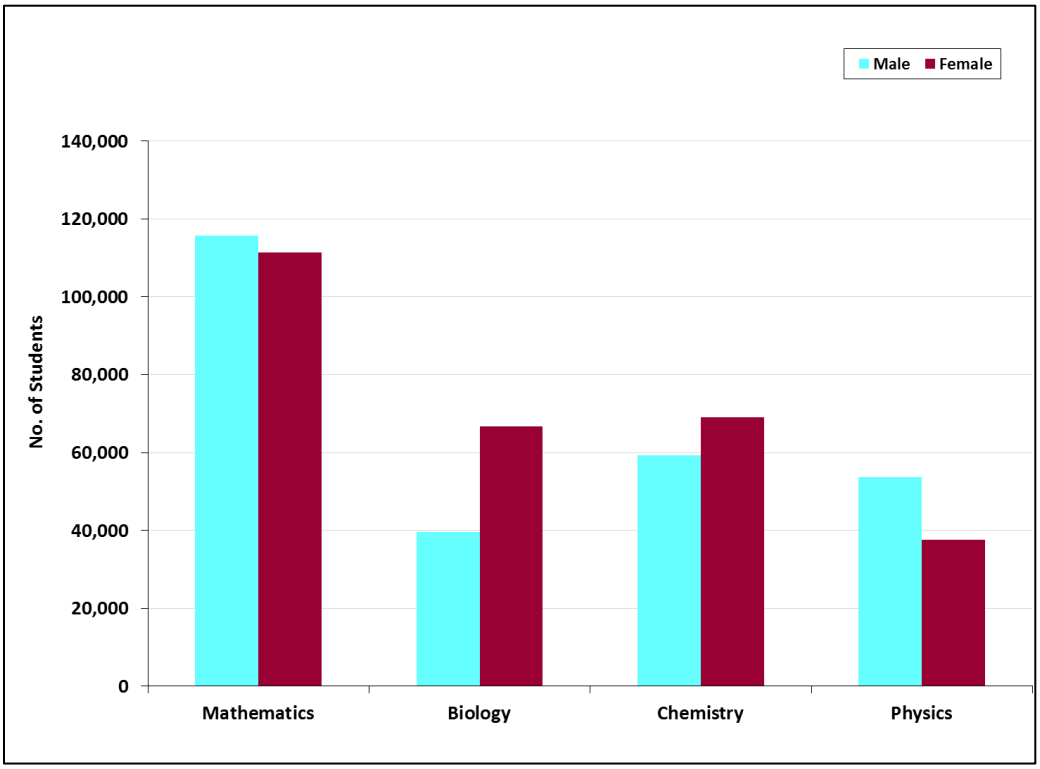


Table 2.8 Number of Students with Credit Attainment for Grade 12, Secondary 5, or Cégep Science and Math Exams

	2009-10		2010-11		2011-12		2012-13		2013-14		2014-15	
Province/Subject	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
British Columbia												
Mathematics	9,443	8,795	9,860	8,851	10,055	9,030	11,187	10,743	11,154	10,674	n.a.	n.a.
Biology	6,478	10,422	6,969	10,525	6,776	10,706	6,493	10,431	6,050	10,182	n.a.	n.a.
Chemistry	5,894	5,693	6,254	6,024	6,420	6,211	6,422	6,374	6,222	6,253	n.a.	n.a.
Physics	5,160	2,281	5,416	2,515	5,577	2,635	5,819	2,906	5,751	2,747	n.a.	n.a.
Alberta												
Mathematics	14,836	15,098	15,068	15,100	15,020	14,808	14,038	14,819	13,622	14,304	14,866	15,626
Biology	7,783	12,495	8,024	12,697	8,265	12,943	7,755	12,841	7,477	12,641	7,305	13,472
Chemistry	7,857	8,964	7,691	8,680	8,286	9,051	8,055	9,130	8,258	8,814	8,641	9,438
Physics	5,792	3,608	5,839	3,746	5,864	3,666	6,067	3,731	6,267	3,588	6,496	3,660
Sciences	2,341	2,184	2,328	2,286	2,713	2,637	3,106	3,155	3,219	3,411	3,574	3,954
Saskatchewan												
Mathematics	4,594	5,078	4,674	5,229	4,206	5,121	4,724	5,348	4,928	5,552	n.a.	n.a.
Biology	3,331	4,851	3,418	5,079	3,241	5,273	3,255	5,425	3,224	5,506	n.a.	n.a.
Chemistry	2,393	3,268	2,416	3,254	2,399	3,370	2,509	3,457	2,462	3,604	n.a.	n.a.
Physics	2,400	2,096	2,419	2,041	2,400	2,087	2,319	1,958	2,410	2,054	n.a.	n.a.
Ontario												
Mathematics	59,373	50,523	59,485	49,807	59,602	50,387	61,749	51,670	60,018	51,301	n.a.	n.a.
Biology	12,851	21,090	13,469	21,792	13,720	22,317	13,314	23,224	12,735	22,962	n.a.	n.a.
Chemistry	21,508	23,975	22,383	24,506	22,818	25,044	23,277	26,018	23,071	25,989	n.a.	n.a.
Physics	18,272	8,329	18,546	8,519	19,402	8,594	20,293	9,274	20,030	9,434	n.a.	n.a.
Prince Edward Island												
Mathematics	498	596	448	556	427	538	427	562	467	467	485	548
Biology	249	431	231	422	220	417	211	458	213	213	195	415
Chemistry	266	351	233	344	217	318	229	350	232	232	235	350
Physics	216	113	185	112	181	103	181	115	194	194	229	135
Quebec - Secondary 5												
Mathematics	15,512	18,234	14,913	17,128	13,802	16,042	13,286	15,439	13,278	15,007	n.a.	n.a.
Biology	968	1,904	804	804	771	1,322	809	1,458	814	1,361	n.a.	n.a.
Chemistry	10,379	13,619	10,685	13,763	10,593	14,115	10,615	14,018	10,723	13,622	n.a.	n.a.
Physics	11,108	12,816	11,327	12,720	11,201	12,965	11,132	12,818	11,246	12,495	n.a.	n.a.
Quebec - Cégep												
Math, Chemistry & Physics	3,883	4,367	4,015	4,421	3,974	4,534	3,818	4,379	4,119	4,654	4,133	4,708
Biology	3,883	4,367	3,983	4,418	3,909	4,522	3,731	4,367	3,984	4,642	3,964	4,687
Manitoba												
Mathematics	3,695	3,921	3,836	3,881	3,652	3,835	3,787	4,009	3,572	3,921	n.a.	n.a.
Biology	2,698	4,210	2,839	4,233	2,723	4,336	2,648	4,242	2,617	4,119	n.a.	n.a.
Chemistry	1,862	1,862	2,113	2,472	2,059	2,412	2,036	2,438	2,038	2,515	n.a.	n.a.
Physics	1,767	1,767	1,883	1,270	1,777	1,359	1,839	1,386	1,797	1,290	n.a.	n.a.
Nova Scotia												
Mathematics	n.a.	n.a.	2,384	2,783	2,588	2,858	2,559	2,958	2,534	3,036	2,512	2,724
Biology	n.a.	n.a.	1,303	2,517	1,493	2,695	1,357	2,660	1,250	2,706	1,250	2,433
Chemistry	n.a.	n.a.	1,214	1,643	1,278	1,783	1,317	3,208	1,239	1,967	1,230	1,709
Physics	n.a.	n.a.	906	456	951	507	955	563	1,006	575	957	520
New Brunswick (Francophone North-East and South Districts only)												
Mathematics	317	433	269	372	297	420	315	417	246	363	n.a.	n.a.
Biology	300	534	261	525	349	626	300	530	290	626	n.a.	n.a.
Chemistry	208	364	182	297	197	354	193	329	167	280	n.a.	n.a.
Physics	228	231	223	221	235	214	247	218	180	187	n.a.	n.a.
Newfoundland and Labrador												
Mathematics	1,620	1,923	1,520	1,875	1,635	1,878	1,345	1,690	1,594	1,907	n.a.	n.a.
Biology	1,035	1,826	874	1,589	902	1,642	938	1,725	921	1,608	n.a.	n.a.
Chemistry	681	894	642	1,030	689	941	733	955	808	1,016	n.a.	n.a.
Physics	570	295	547	347	565	307	611	313	687	376	n.a.	n.a.
Nunavut												
Mathematics	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5	9	7	10	13	14
Biology	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	8	9	11	22	11	22
Chemistry	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0	6	3	11	6	7
Physics	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2	6	4	5	6	2
Science	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5	0	3	2	4	2
Northwest Territories												
Mathematics	119	127	130	152	116	100	177	181	123	142	102	148
Biology	58	98	56	94	66	92	71	112	44	74	49	108
Chemistry	46	62	44	46	39	57	59	51	44	73	40	54
Physics	23	24	49	31	37	24	47	24	44	21	20	26
Experiential Science	10	19	23	26	48	27	66	74	48	60	40	52

Source: Provincial Ministries of Education

n.a: not applicable

In a study investigating gender differences in STEM and computer science programs at universities in Canada,[15] the author used longitudinal data from the Youth in Transition Survey (YITS)[16] and PISA to better understand the relationship between mathematical ability and the choice of a STEM university program among men and women. For the YITS, a sample of youth 15 years old were interviewed in 2000 and re-interviewed every two years until they were 25. The data linked some key educational characteristics measured during adolescence (including PISA tests taken at age 15) with other measures collected in subsequent years, including program choice in university. The study concluded as follows:

> For some, aptitude for a particular subject is a factor in university program choice. Although mathematical ability plays a role, it does not explain gender differences in STEM choices. Young women with a high level of mathematical ability are significantly less likely to enter STEM fields than young men, even young men with a lower level of mathematical ability. This suggests that the gender gap in STEM-related programs is due to other factors. Other possible explanations might include differences in labour market expectations including family and work balance, differences in motivation and interest, and other influences.

[15] D. Hango, *Gender Differences in Science, Technology, Engineering, Mathematics and Computer Science (STEM) Programs at University*, Statistics Canada, Ottawa (ON), Catalogue no. 75-006-X, 2013.

[16] The Youth in Transition Survey (YITS) is a Canadian longitudinal survey designed to provide policy-relevant information about school–work transitions and factors influencing pathways among education, training and work.

2.2 University Enrolments and Degrees

University education performs a number of societal functions, including developing human capital; building the knowledge base (through research and knowledge development); and disseminating, using, and maintaining knowledge. Higher education in science and engineering provides the advanced skills needed for a competitive workforce and, particularly in case of graduate science and engineering education, the research capacity necessary for innovation.[17]

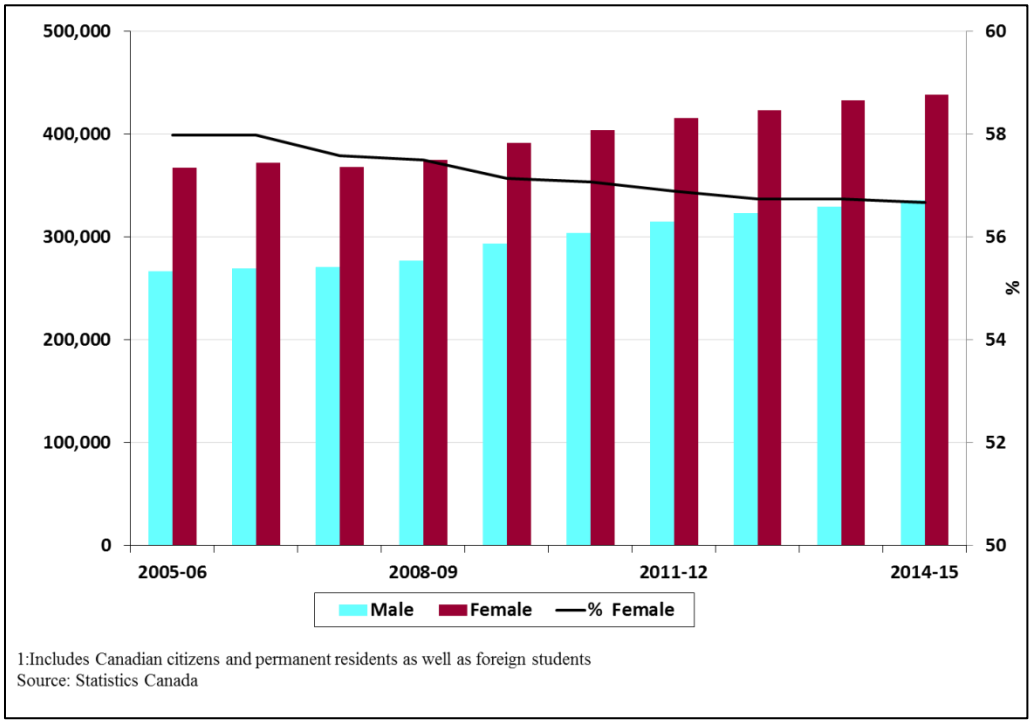
In 2014–15, there were a total of 438,660 female students and 335,436 male students enrolled at the bachelor's level in Canada of which 401,733 female students and 295,665 male students were Canadian citizens or permanent residents. As shown in Figure 2.3, the total number of female and male undergraduate students has steadily increased over the decade from 2005 to 2014. Average annual bachelor's enrolment growth rates over the decade 2005–14 were 2.6 per cent for males and 2.0 per cent for females.

Figures 2.4 and 2.5 present the 2014–15 bachelors' level enrolment distribution patterns for female and male students, respectively. Among the NSE disciplines, the life and physical sciences hold the same ranking for both male and female students, whereas fewer female students choose engineering, mathematics and computer science. Figure 2.6 shows that, while women represent a majority of students enrolled in undergraduate programs in Canada, they are not the majority in every program.

The number of males and females enrolled in full-time studies in the NSE has grown in absolute numbers in the past decade as shown in Figure 2.7. After being relatively stable at approximately 38 per cent since 2009, the percentage of women enrolled in the NSE at bachelor's level saw a slight increase from 2013–14 to 2014–15. A closer examination of bachelor enrolment trends for Canadian citizens and permanent residents (Table 2.9 and Figure 2.8) reveals that, after a decline in the percentage of enrolment in the NSE for both sexes before 2009–10, the enrolment has been gradually increasing since then, with the rate of increase being slightly greater for male students.

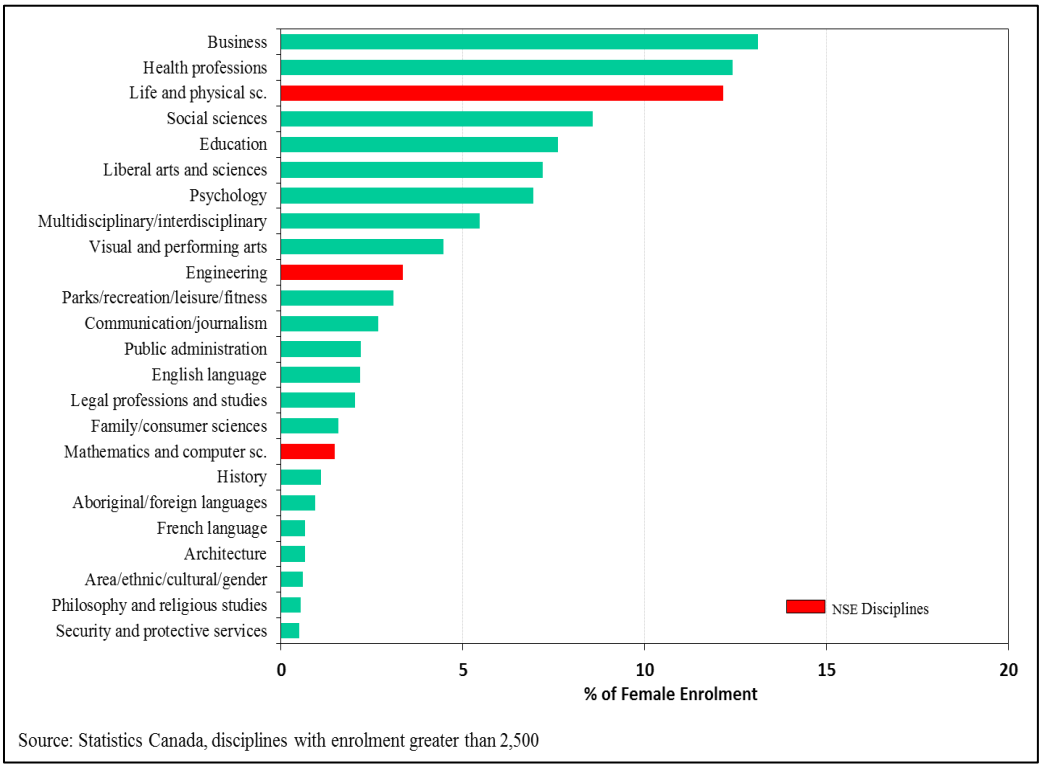
[17] National Science Board, *Science & Engineering Indicators 2010*, National Science Foundation (NSB 10-01), Arlington (VA), 2010, pp. 2–7.

Figure 2.3 Full-Time Bachelor's Enrolment,[1] 2005–2014



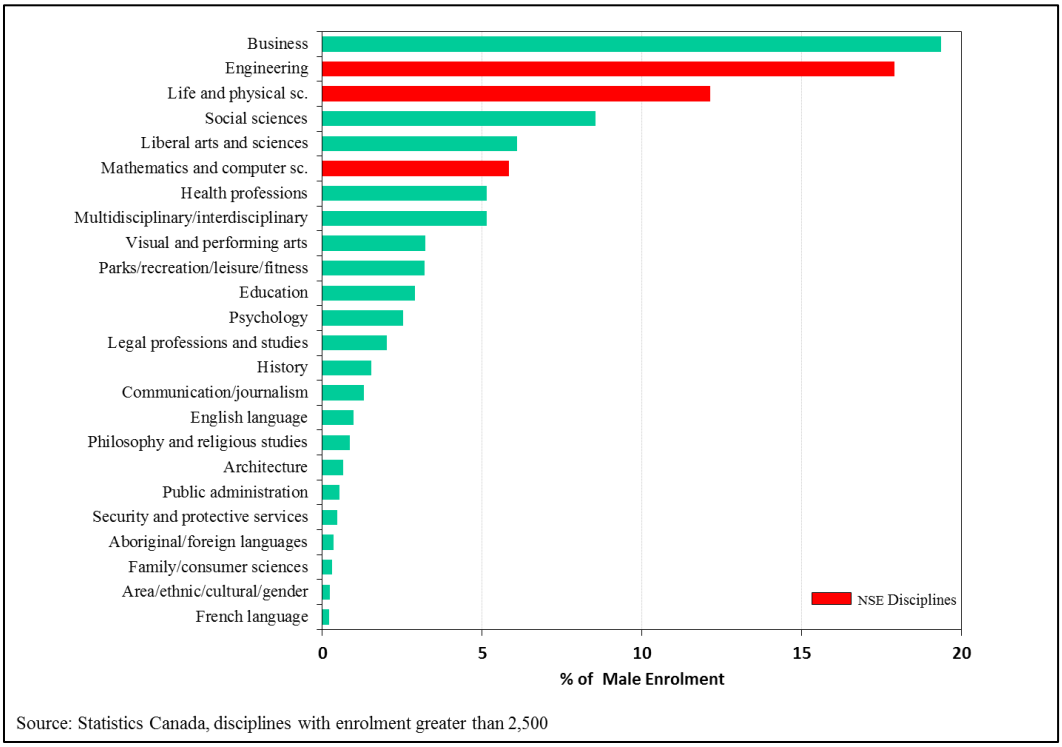
1:Includes Canadian citizens and permanent residents as well as foreign students
Source: Statistics Canada

Figure 2.4 Full-Time Female Bachelor's Enrolment by Discipline, 2014–15



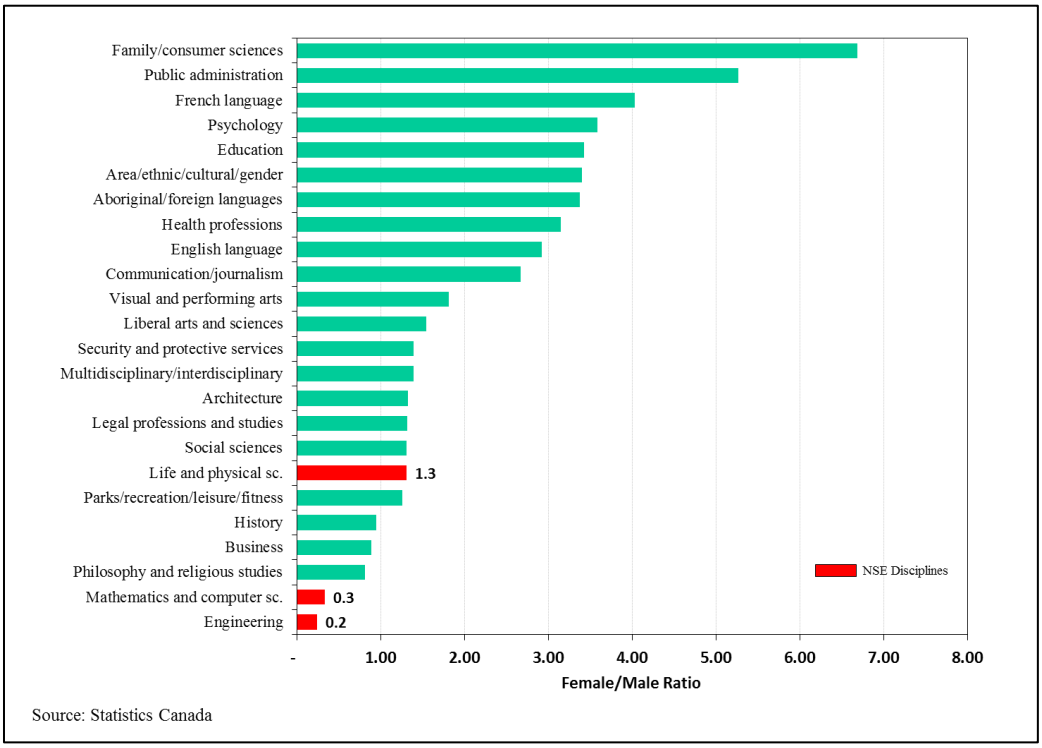
Source: Statistics Canada, disciplines with enrolment greater than 2,500

Figure 2.5 Full-Time Male Bachelor's Enrolment by Discipline, 2014–15



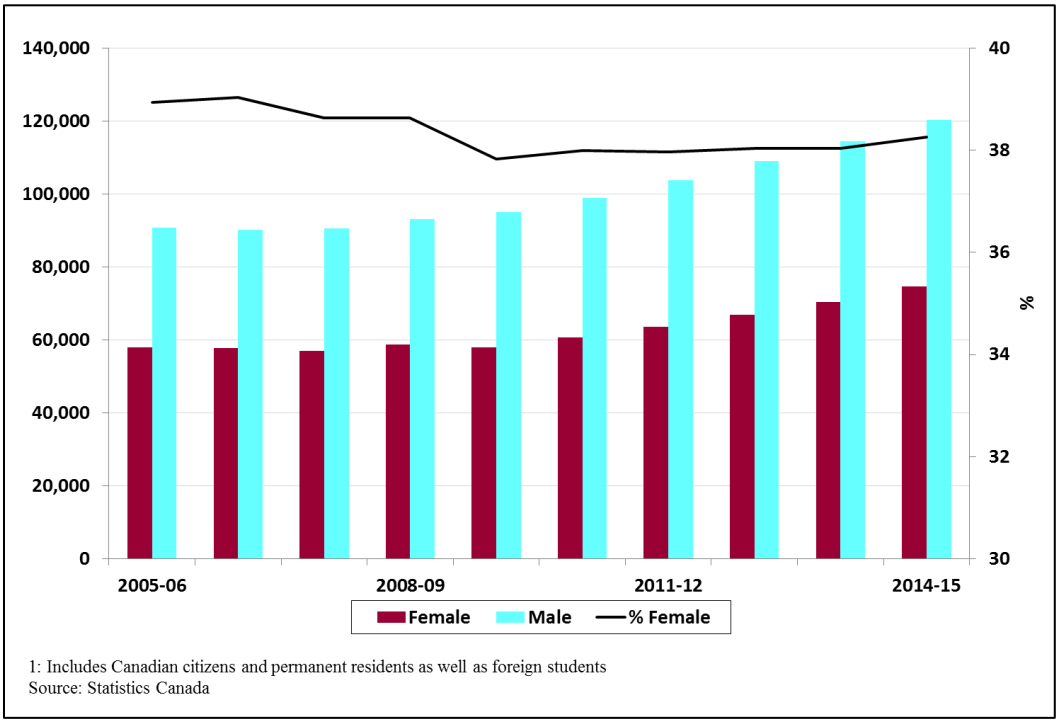
Source: Statistics Canada, disciplines with enrolment greater than 2,500

Figure 2.6 Full-Time Bachelor's Enrolment by Discipline—Female/Male Ratio, 2014–15



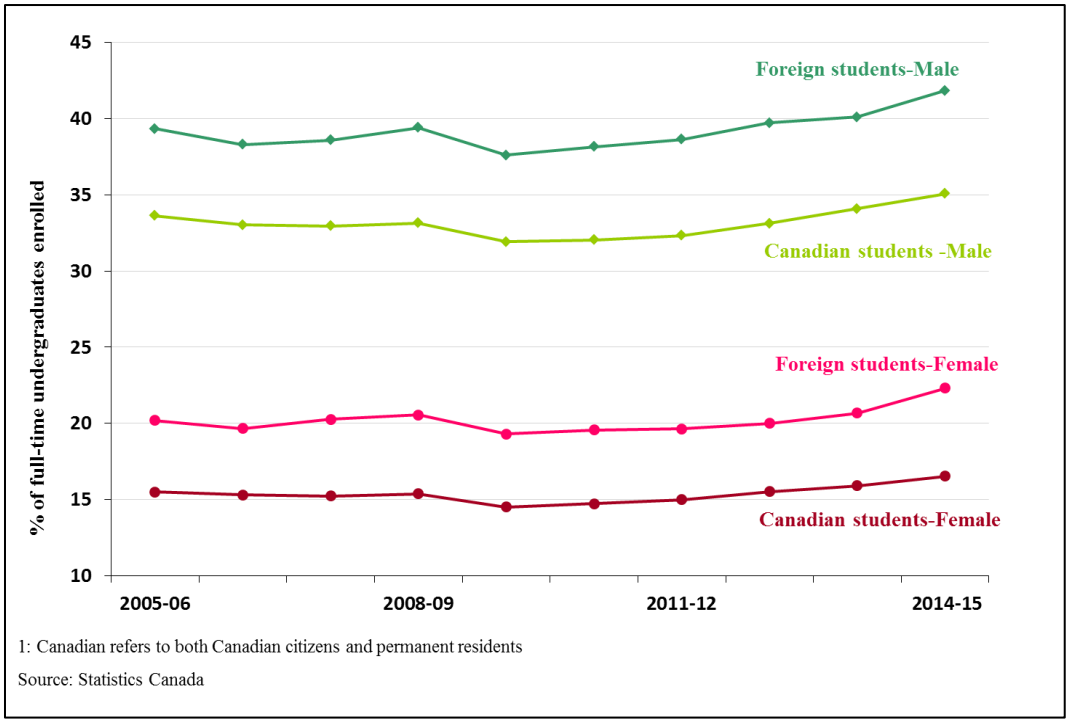
Source: Statistics Canada

Figure 2.7 Full-Time Bachelor's Enrolment[1] in the Natural Sciences and Engineering, 2005–2014



1: Includes Canadian citizens and permanent residents as well as foreign students
Source: Statistics Canada

Figure 2.8 Percentage of Full-Time Undergraduates Who Choose to Study the NSE—by Sex and Immigration[1] Status, 2005–2014



1: Canadian refers to both Canadian citizens and permanent residents
Source: Statistics Canada

Table 2.9 Bachelor's Enrolment (Full-Time) in the Natural Sciences and Engineering[1] 2005–2014

Canadian and Permanent Residents:

Academic	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005-06	30,075	40,914	70,989	57.6	39,405	8,511	47,916	17.8	13,170	4,635	17,805	26.0	82,650	54,060	136,710	39.5
2006-07	30,999	41,418	72,417	57.2	39,399	8,370	47,769	17.5	11,817	4,197	16,014	26.2	82,215	53,985	136,200	39.6
2007-08	31,356	40,662	72,018	56.5	39,663	8,505	48,168	17.7	11,367	3,942	15,309	25.7	82,386	53,109	135,495	39.2
2008-09	32,916	41,988	74,904	56.1	40,188	8,583	48,771	17.6	11,355	3,957	15,312	25.8	84,459	54,528	138,987	39.2
2009-10	32,892	41,043	73,935	55.5	41,823	8,961	50,784	17.6	11,274	3,681	14,955	24.6	85,989	53,685	139,674	38.4
2010-11	34,695	43,029	77,724	55.4	42,720	9,246	51,966	17.8	11,625	3,801	15,426	24.6	89,040	56,076	145,116	38.6
2011-12	36,003	44,883	80,886	55.5	44,091	9,645	53,736	17.9	12,237	3,870	16,107	24.0	92,331	58,398	150,729	38.7
2012-13	37,104	46,848	83,952	55.8	45,882	10,368	56,250	18.4	13,182	4,002	17,184	23.3	96,168	61,218	157,386	38.9
2013-14	37,491	48,237	85,728	56.3	48,303	11,238	59,541	18.9	14,367	4,260	18,627	22.9	100,161	63,735	163,896	38.9
2014-15	36,642	49,386	86,028	57.4	51,246	12,369	63,615	19.4	15,819	4,599	20,418	22.5	103,707	66,354	170,061	39.0
Avg. Growth																
2005-14	**2.2%**	**2.1%**	**2.2%**	-	**3.0%**	**4.2%**	**3.2%**	-	**2.1%**	**-0.1%**	**1.5%**	-	**2.6%**	**2.3%**	**2.5%**	-

Foreign Students:

Academic	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005-06	1,821	2,088	3,909	53.4	3,930	819	4,749	17.2	2,337	909	3,246	28.0	8,088	3,816	11,904	32.1
2006-07	1,839	2,028	3,867	52.4	3,987	825	4,812	17.1	2,079	888	2,967	29.9	7,905	3,741	11,646	32.1
2007-08	1,836	2,106	3,942	53.4	4,293	912	5,205	17.5	2,043	906	2,949	30.7	8,172	3,924	12,096	32.4
2008-09	2,088	2,229	4,317	51.6	4,707	990	5,697	17.4	1,893	894	2,787	32.1	8,688	4,113	12,801	32.1
2009-10	2,184	2,310	4,494	51.4	5,211	1,140	6,351	17.9	1,731	744	2,475	30.1	9,126	4,194	13,320	31.5
2010-11	2,439	2,499	4,938	50.6	5,625	1,248	6,873	18.2	1,881	852	2,733	31.2	9,945	4,599	14,544	31.6
2011-12	2,799	2,769	5,568	49.7	6,393	1,398	7,791	17.9	2,217	936	3,153	29.7	11,409	5,103	16,512	30.9
2012-13	3,174	2,997	6,171	48.6	7,068	1,569	8,637	18.2	2,676	1,191	3,867	30.8	12,918	5,757	18,675	30.8
2013-14	3,579	3,327	6,906	48.2	7,764	1,866	9,630	19.4	3,024	1,401	4,425	31.7	14,367	6,594	20,961	31.5
2014-15	4,059	3,978	8,037	49.5	8,811	2,349	11,160	21.0	3,771	1,908	5,679	33.6	16,641	8,235	24,876	33.1
Avg. Growth																
2005-14	**9.3%**	**7.4%**	**8.3%**	-	**9.4%**	**12.4%**	**10.0%**	-	**5.5%**	**8.6%**	**6.4%**	-	**8.3%**	**8.9%**	**8.5%**	-

Total:

Academic	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005-06	31,896	43,002	74,898	57.4	43,335	9,330	52,665	17.7	15,507	5,544	21,051	26.3	90,738	57,876	148,614	38.9
2006-07	32,838	43,446	76,284	57.0	43,386	9,195	52,581	17.5	13,896	5,085	18,981	26.8	90,120	57,726	147,846	39.0
2007-08	33,192	42,768	75,960	56.3	43,956	9,417	53,373	17.6	13,410	4,848	18,258	26.6	90,558	57,033	147,591	38.6
2008-09	35,004	44,217	79,221	55.8	44,895	9,573	54,468	17.6	13,248	4,851	18,099	26.8	93,147	58,641	151,788	38.6
2009-10	35,076	43,353	78,429	55.3	47,034	10,101	57,135	17.7	13,005	4,425	17,430	25.4	95,115	57,879	152,994	37.8
2010-11	37,134	45,528	82,662	55.1	48,345	10,494	58,839	17.8	13,506	4,653	18,159	25.6	98,985	60,675	159,660	38.0
2011-12	38,802	47,652	86,454	55.1	50,484	11,043	61,527	17.9	14,454	4,806	19,260	25.0	103,740	63,501	167,241	38.0
2012-13	40,278	49,845	90,123	55.3	52,950	11,937	64,887	18.4	15,858	5,193	21,051	24.7	109,086	66,975	176,061	38.0
2013-14	41,070	51,564	92,634	55.7	56,067	13,104	69,171	18.9	17,391	5,661	23,052	24.6	114,528	70,329	184,857	38.0
2014-15	40,701	53,364	94,065	56.7	60,057	14,718	74,775	19.7	19,590	6,507	26,097	24.9	120,348	74,589	194,937	38.3
Avg. Growth																
2005-14	**2.7%**	**2.4%**	**2.6%**	-	**3.7%**	**5.2%**	**4.0%**	-	**2.6%**	**1.8%**	**2.4%**	-	**3.2%**	**2.9%**	**3.1%**	-

1. Includes data for major fields in the NSE.
Source: Statistics Canada

Enrolment trends by sex at the master's level are presented in Figures 2.9 and 2.10 and Table 2.10. While the overall enrolment of female students at the master's level outnumbered male enrolment over the past decade, this has not been the case in the NSE. The percentage of female students at the master's level for the NSE from 2005 to 2014 averaged 37 per cent. From 2005 to 2014, master's enrolment in the NSE increased by 32 per cent for female students compared with a 35 per cent increase for male students.

Enrolment trends by sex at the doctoral level are presented in Figures 2.11 and 2.12 and Table 2.11. In the NSE, the average percentage of female students at the doctoral level was 32 per cent for the 2005–2014 period. Nevertheless, unlike the fluctuations in the NSE trends at the bachelor's and master's levels, the percentage of female students at the doctoral level has been steadily increasing, to reach 34 per cent by 2014–15. From 2005 to 2014, total doctoral NSE enrolment increased by 60 per cent for female students and 38 per cent for male students.

Figures 2.10 and 2.12 also highlight some trends with respect to foreign student enrolment in Canada in the NSE, which has been growing faster for both sexes than Canadian and permanent resident enrolment for the 2005–2014 period at both the master's and doctoral levels. These higher growth rates have translated into a larger share of 2014–15 NSE master's and doctoral enrolment of foreign students for both sexes than ever before.

Figure 2.13 compares the enrolment of Canadians (including permanent residents) and international female students in the NSE disciplines at various degree levels. In general, mathematics and computer science disciplines are not commonly chosen fields of study for women at any degree level. Life and physical science disciplines are the most frequent choices for all women at the bachelor's and doctoral levels. However, among international female students studying in the NSE disciplines, a higher proportion study engineering, mathematics and computer science disciplines compared with Canadian female students (including permanent residents).

The inflow of international students in the NSE provides Canada with a large pool of well-educated individuals with potential to become permanent residents. A Statistics Canada study[18] reports that almost one-half (49 per cent) of international students in the early 2000s cohort who pursued graduate studies obtained permanent residence in Canada in the subsequent 10 years.

[18] L. Yuqian and H. Feng, *International students who become permanent residents in Canada*, Statistics Canada, Ottawa (ON), Catalogue no. 75-006-X, 2015.

Figure 2.9 Full-time Master's Enrolment in the Natural Sciences and Engineering, 2005–2014

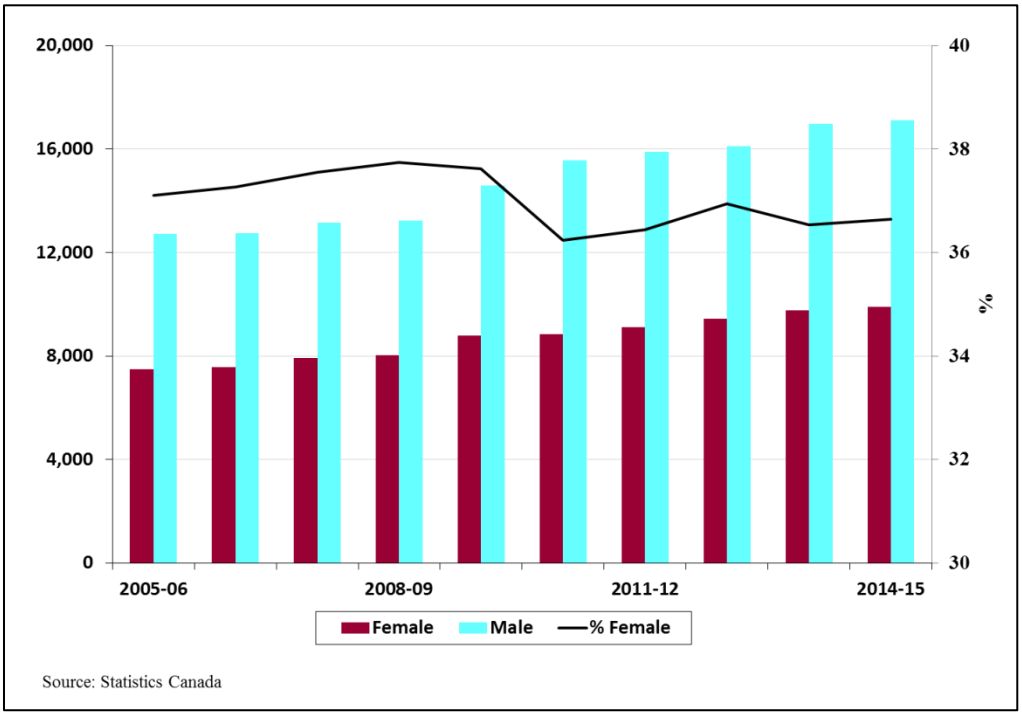


Figure 2.10 Percentage of Full-Time Master's Students Who Choose an NSE Program—by Sex and Immigration[1] Status, 2005-2014

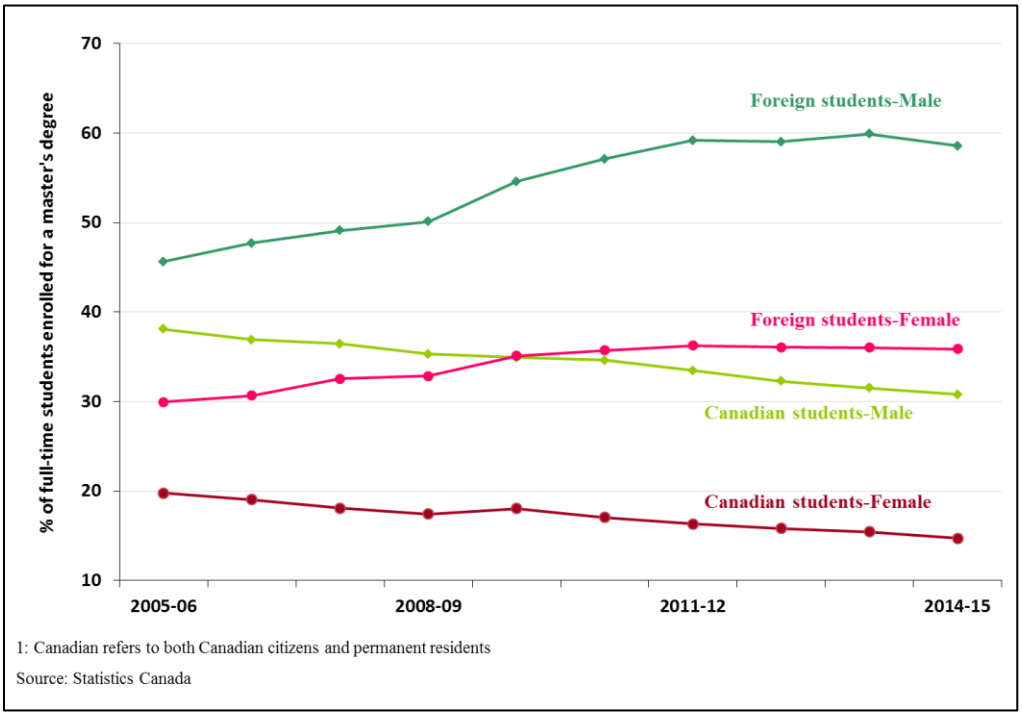


Figure 2.11 Full-time Doctoral Enrolment in the Natural Sciences and Engineering, 2005–2014

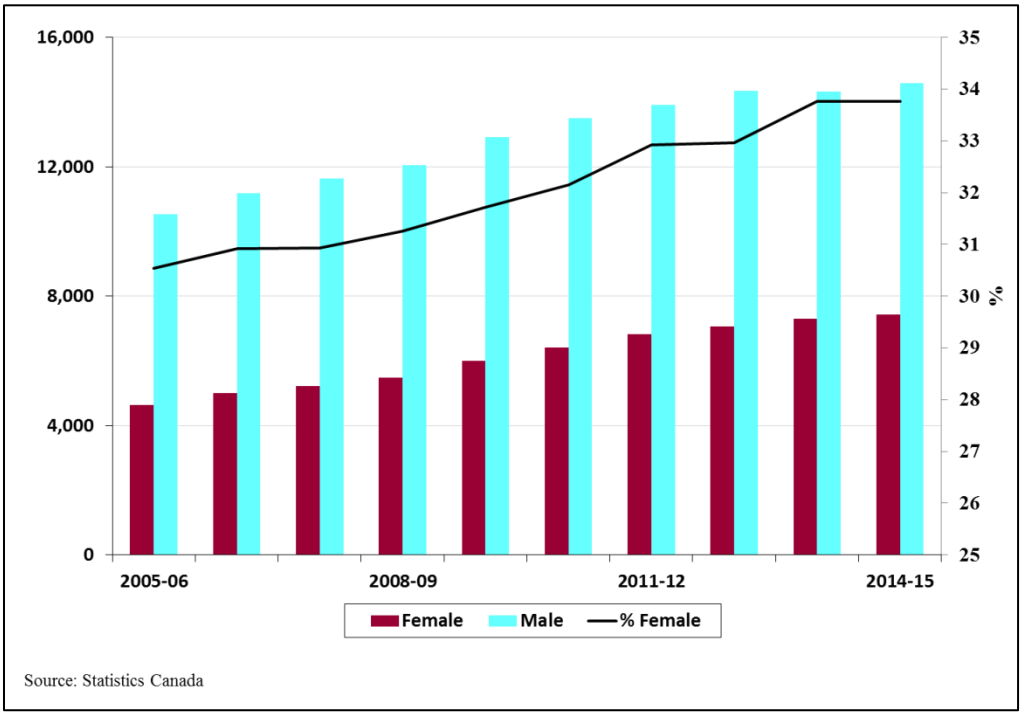


Figure 2.12 Percentage of Full-Time Doctoral Students Who Choose an NSE Program—by Sex and Immigation[1] Status, 2005–2014

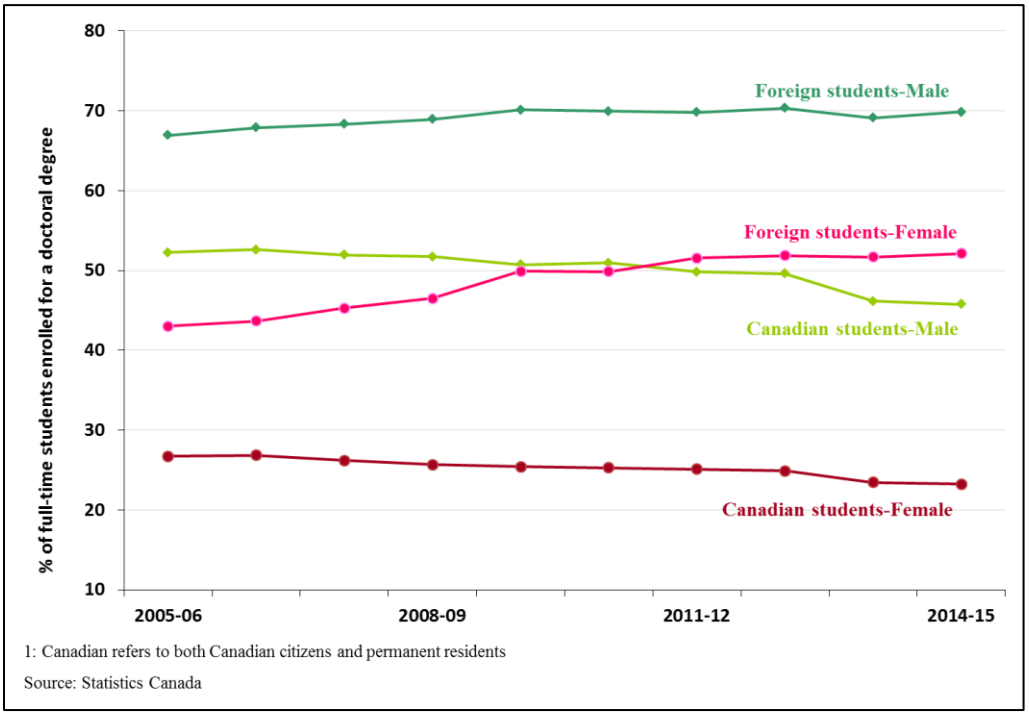
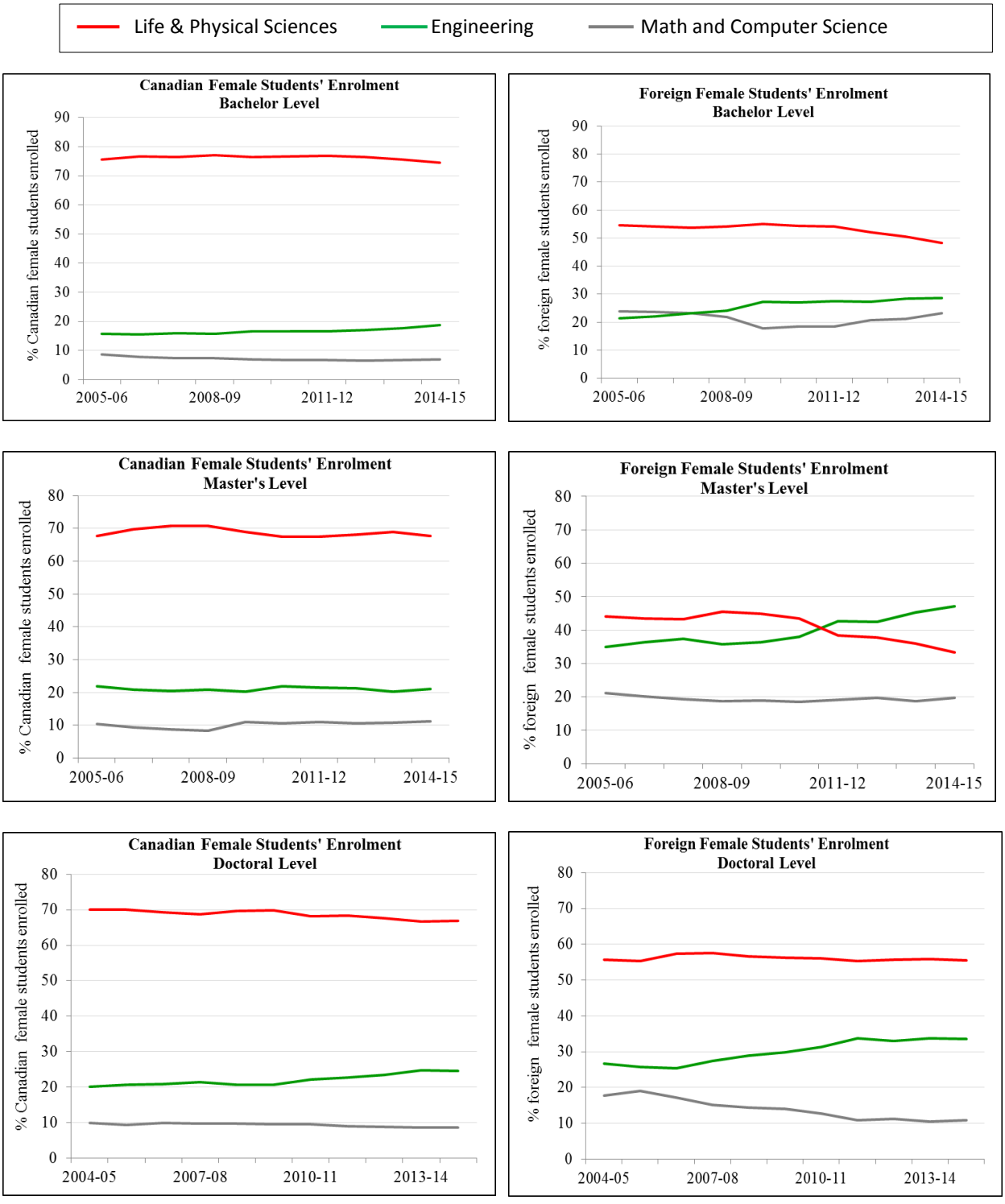


Figure 2.13 Canadian[1] and International Female Students' Enrolment in the NSE Disciplines



[1] Canadian citizens and permanent residents

Source: Statistics Canada

Table 2.10 Master's Enrolment (Full-Time) in the Natural Sciences and Engineering[1] 2005–2014

Canadian and Permanent Residents:

Academic	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005-06	3,405	4,104	7,509	54.7	4,452	1,323	5,775	22.9	1,749	633	2,382	26.6	9,606	6,060	15,666	38.7
2006-07	3,561	4,242	7,803	54.4	4,221	1,263	5,484	23.0	1,722	567	2,289	24.8	9,504	6,072	15,576	39.0
2007-08	3,771	4,461	8,232	54.2	4,419	1,293	5,712	22.6	1,623	552	2,175	25.4	9,813	6,306	16,119	39.1
2008-09	3,741	4,491	8,232	54.6	4,374	1,326	5,700	23.3	1,554	522	2,076	25.1	9,669	6,339	16,008	39.6
2009-10	3,927	4,626	8,553	54.1	4,572	1,353	5,925	22.8	1,551	735	2,286	32.2	10,050	6,714	16,764	40.1
2010-11	3,939	4,377	8,316	52.6	4,722	1,416	6,138	23.1	1,497	687	2,184	31.5	10,158	6,480	16,638	38.9
2011-12	3,894	4,314	8,208	52.6	4,443	1,368	5,811	23.5	1,446	699	2,145	32.6	9,783	6,381	16,164	39.5
2012-13	3,744	4,281	8,025	53.3	4,230	1,338	5,568	24.0	1,371	669	2,040	32.8	9,345	6,288	15,633	40.2
2013-14	3,789	4,386	8,175	53.7	4,173	1,293	5,466	23.7	1,356	681	2,037	33.4	9,318	6,360	15,678	40.6
2014-15	3,618	4,146	7,764	53.4	4,023	1,296	5,319	24.4	1,314	684	1,998	34.2	8,955	6,126	15,081	40.6
Avg. Growth 2005-14	**0.7%**	**0.1%**	**0.4%**	-	**-1.1%**	**-0.2%**	**-0.9%**	-	**-3.1%**	**0.9%**	**-1.9%**	-	**-0.8%**	**0.1%**	**-0.4%**	-

Foreign Students:

Academic	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005-06	714	633	1,347	47.0	1,668	501	2,169	23.1	723	303	1,026	29.5	3,105	1,437	4,542	31.6
2006-07	735	648	1,383	46.9	1,728	543	2,271	23.9	765	300	1,065	28.2	3,228	1,491	4,719	31.6
2007-08	765	693	1,458	47.5	1,818	600	2,418	24.8	759	309	1,068	28.9	3,342	1,602	4,944	32.4
2008-09	768	765	1,533	49.9	1,986	600	2,586	23.2	807	315	1,122	28.1	3,561	1,680	5,241	32.1
2009-10	900	930	1,830	50.8	2,646	753	3,399	22.2	978	393	1,371	28.7	4,524	2,076	6,600	31.5
2010-11	996	1,026	2,022	50.7	3,222	897	4,119	21.8	1,182	438	1,620	27.0	5,400	2,361	7,761	30.4
2011-12	1,071	1,044	2,115	49.4	3,669	1,158	4,827	24.0	1,353	519	1,872	27.7	6,093	2,721	8,814	30.9
2012-13	1,119	1,188	2,307	51.5	4,170	1,332	5,502	24.2	1,464	621	2,085	29.8	6,753	3,141	9,894	31.7
2013-14	1,146	1,224	2,370	51.6	4,887	1,545	6,432	24.0	1,620	639	2,259	28.3	7,653	3,408	11,061	30.8
2014-15	1,134	1,257	2,391	52.6	5,316	1,779	7,095	25.1	1,713	741	2,454	30.2	8,163	3,777	11,940	31.6
Avg. Growth 2005-14	**5.3%**	**7.9%**	**6.6%**	-	**13.7%**	**15.1%**	**14.1%**	-	**10.1%**	**10.4%**	**10.2%**	-	**11.3%**	**11.3%**	**11.3%**	-

Total:

Academic	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005-06	4,119	4,737	8,856	53.5	6,120	1,824	7,944	23.0	2,472	936	3,408	27.5	12,711	7,497	20,208	37.1
2006-07	4,296	4,890	9,186	53.2	5,949	1,806	7,755	23.3	2,487	867	3,354	25.8	12,732	7,563	20,295	37.3
2007-08	4,536	5,154	9,690	53.2	6,237	1,893	8,130	23.3	2,382	861	3,243	26.5	13,155	7,908	21,063	37.5
2008-09	4,509	5,256	9,765	53.8	6,360	1,926	8,286	23.2	2,361	837	3,198	26.2	13,230	8,019	21,249	37.7
2009-10	4,827	5,556	10,383	53.5	7,218	2,106	9,324	22.6	2,529	1,128	3,657	30.8	14,574	8,790	23,364	37.6
2010-11	4,935	5,403	10,338	52.3	7,944	2,313	10,257	22.6	2,679	1,125	3,804	29.6	15,558	8,841	24,399	36.2
2011-12	4,965	5,358	10,323	51.9	8,112	2,526	10,638	23.7	2,799	1,218	4,017	30.3	15,876	9,102	24,978	36.4
2012-13	4,863	5,469	10,332	52.9	8,400	2,670	11,070	24.1	2,835	1,290	4,125	31.3	16,098	9,429	25,527	36.9
2013-14	4,935	5,610	10,545	53.2	9,060	2,838	11,898	23.9	2,976	1,320	4,296	30.7	16,971	9,768	26,739	36.5
2014-15	4,752	5,403	10,155	53.2	9,339	3,075	12,414	24.8	3,027	1,425	4,452	32.0	17,118	9,903	27,021	36.6
Avg. Growth 2005-14	**1.6%**	**1.5%**	**1.5%**	-	**4.8%**	**6.0%**	**5.1%**	-	**2.3%**	**4.8%**	**3.0%**	-	**3.4%**	**3.1%**	**3.3%**	-

1. Includes data for major fields in the NSE.

Source: Statistics Canada

Table 2.11 Doctoral Enrolment (Full-Time) in the Natural Sciences and Engineering[1] 2005–2014

Canadian and Permanent Residents:

Academic	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005-06	3,249	2,433	5,682	42.8	2,871	717	3,588	20.0	1,044	327	1,371	23.9	7,164	3,477	10,641	32.7
2006-07	3,465	2,634	6,099	43.2	3,183	792	3,975	19.9	1,164	375	1,539	24.4	7,812	3,801	11,613	32.7
2007-08	3,618	2,694	6,312	42.7	3,240	843	4,083	20.6	1,245	384	1,629	23.6	8,103	3,921	12,024	32.6
2008-09	3,675	2,802	6,477	43.3	3,285	831	4,116	20.2	1,296	393	1,689	23.3	8,256	4,026	12,282	32.8
2009-10	3,753	2,925	6,678	43.8	3,354	864	4,218	20.5	1,296	402	1,698	23.7	8,403	4,191	12,594	33.3
2010-11	3,804	2,940	6,744	43.6	3,510	954	4,464	21.4	1,314	414	1,728	24.0	8,628	4,308	12,936	33.3
2011-12	3,702	2,979	6,681	44.6	3,468	987	4,455	22.2	1,206	387	1,593	24.3	8,376	4,353	12,729	34.2
2012-13	3,651	2,943	6,594	44.6	3,498	1,023	4,521	22.6	1,170	384	1,554	24.7	8,319	4,350	12,669	34.3
2013-14	3,498	2,889	6,387	45.2	3,267	1,074	4,341	24.7	1,128	372	1,500	24.8	7,893	4,335	12,228	35.5
2014-15	3,429	2,823	6,252	45.2	3,129	1,035	4,164	24.9	1,161	363	1,524	23.8	7,719	4,221	11,940	35.4
Avg. Growth 2005-14	**0.6%**	**1.7%**	**1.1%**	-	**1.0%**	**4.2%**	**1.7%**	-	**1.2%**	**1.2%**	**1.2%**	-	**0.8%**	**2.2%**	**1.3%**	-

Foreign Students:

Academic	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005-06	1,260	639	1,899	33.6	1,542	297	1,839	16.2	573	219	792	27.7	3,375	1,155	4,530	25.5
2006-07	1,263	690	1,953	35.3	1,539	306	1,845	16.6	567	207	774	26.7	3,369	1,203	4,572	26.3
2007-08	1,269	744	2,013	37.0	1,671	354	2,025	17.5	597	195	792	24.6	3,537	1,293	4,830	26.8
2008-09	1,302	822	2,124	38.7	1,878	420	2,298	18.3	612	210	822	25.5	3,792	1,452	5,244	27.7
2009-10	1,506	1,017	2,523	40.3	2,283	540	2,823	19.1	723	252	975	25.8	4,512	1,809	6,321	28.6
2010-11	1,632	1,173	2,805	41.8	2,472	654	3,126	20.9	777	267	1,044	25.6	4,881	2,094	6,975	30.0
2011-12	1,803	1,365	3,168	43.1	2,865	834	3,699	22.5	858	270	1,128	23.9	5,526	2,469	7,995	30.9
2012-13	2,013	1,506	3,519	42.8	3,126	894	4,020	22.2	891	306	1,197	25.6	6,030	2,706	8,736	31.0
2013-14	2,142	1,656	3,798	43.6	3,363	1,002	4,365	23.0	927	309	1,236	25.0	6,432	2,967	9,399	31.6
2014-15	2,160	1,782	3,942	45.2	3,696	1,080	4,776	22.6	1,008	351	1,359	25.8	6,864	3,213	10,077	31.9
Avg. Growth 2005-14	**6.2%**	**12.1%**	**8.5%**	-	**10.2%**	**15.4%**	**11.2%**	-	**6.5%**	**5.4%**	**6.2%**	-	**8.2%**	**12.0%**	**9.3%**	-

Total:

Academic	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005-06	4,509	3,072	7,581	40.5	4,413	1,014	5,427	18.7	1,617	546	2,163	25.2	10,539	4,632	15,171	30.5
2006-07	4,728	3,324	8,052	41.3	4,722	1,098	5,820	18.9	1,731	582	2,313	25.2	11,181	5,004	16,185	30.9
2007-08	4,887	3,438	8,325	41.3	4,911	1,197	6,108	19.6	1,842	579	2,421	23.9	11,640	5,214	16,854	30.9
2008-09	4,977	3,624	8,601	42.1	5,163	1,251	6,414	19.5	1,908	603	2,511	24.0	12,048	5,478	17,526	31.3
2009-10	5,259	3,942	9,201	42.8	5,637	1,404	7,041	19.9	2,019	654	2,673	24.5	12,915	6,000	18,915	31.7
2010-11	5,436	4,113	9,549	43.1	5,982	1,608	7,590	21.2	2,091	681	2,772	24.6	13,509	6,402	19,911	32.2
2011-12	5,505	4,344	9,849	44.1	6,333	1,821	8,154	22.3	2,064	657	2,721	24.1	13,902	6,822	20,724	32.9
2012-13	5,664	4,449	10,113	44.0	6,624	1,917	8,541	22.4	2,061	690	2,751	25.1	14,349	7,056	21,405	33.0
2013-14	5,640	4,545	10,185	44.6	6,630	2,076	8,706	23.8	2,055	681	2,736	24.9	14,325	7,302	21,627	33.8
2014-15	5,589	4,605	10,194	45.2	6,825	2,115	8,940	23.7	2,169	714	2,883	24.8	14,583	7,434	22,017	33.8
Avg. Growth 2005-14	**2.4%**	**4.6%**	**3.3%**	-	**5.0%**	**8.5%**	**5.7%**	-	**3.3%**	**3.0%**	**3.2%**	-	**3.7%**	**5.4%**	**4.2%**	-

1. Includes data for major fields in the NSE.

Source: Statistics Canada

Degrees Granted

Table 2.12 presents the number of degrees awarded in the NSE by sex, while Figure 2.14 indicates the trend in NSE degrees awarded to women from 2004 to 2013. Unfortunately, a breakdown between Canadian citizens and permanent residents, on the one hand, and foreign students, on the other, is not available. The share of degrees awarded in the NSE to female students has remained relatively stable at the bachelor's and master's levels, and has increased slightly at the doctoral level. Figure 2.14 also illustrates the reduction in the share of degrees awarded in the NSE to women at higher degree levels. Figure 2.15 depicts the proportion of degrees granted in the NSE to female students across the various levels of study in the major NSE disciplines in 2005 and 2014. The significant reduction at the doctoral level ultimately affects the number of women continuing to careers in research, as discussed in Section 3.2.

Figure 2.14 Degrees Granted to Female Students in the Natural Sciences and Engineering as a Percentage of Total Granted in the NSE—by Degree Level, 2005–2014

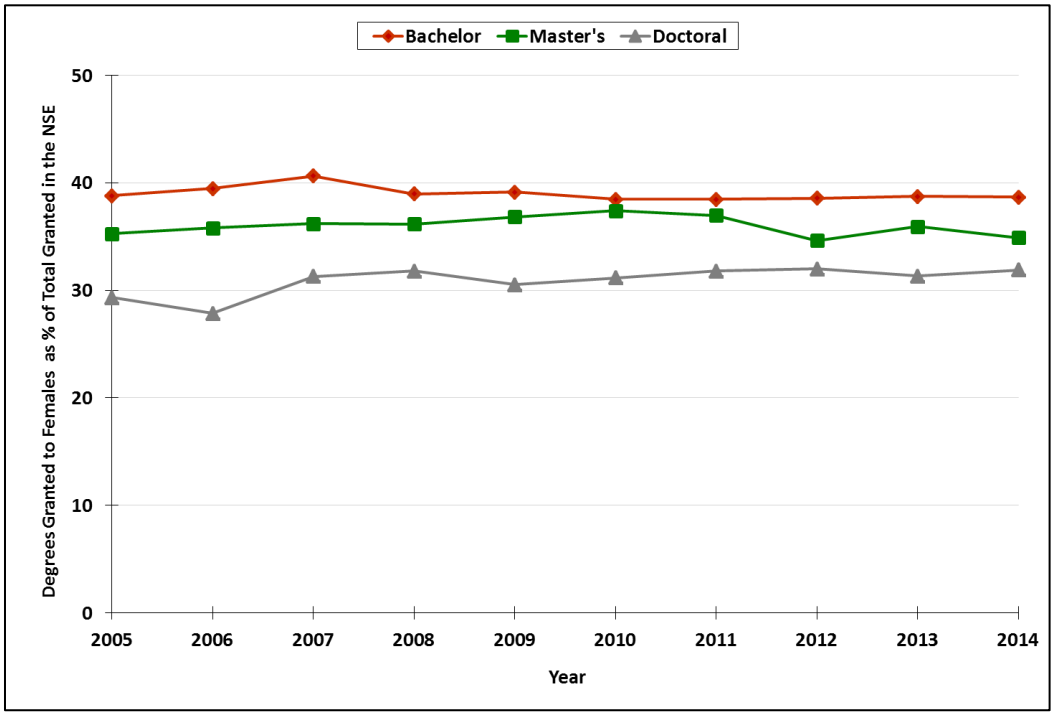


Table 2.12 Degrees[1] Granted in the Natural Sciences and Engineering[2], 2005—2014

Bachelor's and First Professional Degree:

	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005	5,430	7,896	13,326	59.3	8,385	2,211	10,596	20.9	4,905	1,767	6,672	26.5	18,720	11,874	30,594	38.8
2006	5,766	8,748	14,514	60.3	8,958	2,130	11,088	19.2	4,557	1,686	6,243	27.0	19,281	12,564	31,845	39.5
2007	6,396	9,822	16,218	60.6	9,501	2,256	11,757	19.2	4,026	1,554	5,580	27.8	19,923	13,632	33,555	40.6
2008	6,384	9,120	15,504	58.8	9,591	2,097	11,688	17.9	3,684	1,344	5,028	26.7	19,659	12,561	32,220	39.0
2009	6,591	9,129	15,720	58.1	9,111	1,935	11,046	17.5	3,264	1,137	4,401	25.8	18,966	12,201	31,167	39.1
2010	6,396	8,748	15,144	57.8	9,429	1,953	11,382	17.2	2,904	1,014	3,918	25.9	18,729	11,715	30,444	38.5
2011	6,813	9,054	15,867	57.1	9,606	2,061	11,667	17.7	2,913	966	3,879	24.9	19,332	12,081	31,413	38.5
2012	6,942	9,195	16,137	57.0	9,777	2,157	11,934	18.1	3,009	1,032	4,041	25.5	19,728	12,384	32,112	38.6
2013	7,173	9,717	16,890	57.5	10,548	2,394	12,942	18.5	3,261	1,161	4,422	26.3	20,982	13,272	34,254	38.7
2014	7,605	10,206	17,811	57.3	11,037	2,535	13,572	18.7	3,519	1,233	4,752	25.9	22,161	13,974	36,135	38.7
Avg. Growth 2005-14	**3.8%**	**2.9%**	**3.3%**	-	**3.1%**	**1.5%**	**2.8%**	-	**-3.6%**	**-3.9%**	**-3.7%**	-	**1.9%**	**1.8%**	**1.9%**	-

Master's:

	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005	1,203	1,449	2,652	54.6	2,886	903	3,789	23.8	1,107	480	1,587	30.2	5,196	2,832	8,028	35.3
2006	1,251	1,581	2,832	55.8	2,844	825	3,669	22.5	1,083	483	1,566	30.8	5,178	2,889	8,067	35.8
2007	1,233	1,542	2,775	55.6	2,694	846	3,540	23.9	1,041	429	1,470	29.2	4,968	2,817	7,785	36.2
2008	1,389	1,635	3,024	54.1	2,709	846	3,555	23.8	990	402	1,392	28.9	5,088	2,883	7,971	36.2
2009	1,410	1,800	3,210	56.1	2,913	903	3,816	23.7	1,002	402	1,404	28.6	5,325	3,105	8,430	36.8
2010	1,518	1,977	3,495	56.6	3,048	879	3,927	22.4	1,056	501	1,557	32.2	5,622	3,357	8,979	37.4
2011	1,533	1,920	3,453	55.6	3,279	996	4,275	23.3	1,089	546	1,635	33.4	5,901	3,462	9,363	37.0
2012	1,722	1,902	3,624	52.5	3,756	1,095	4,851	22.6	1,197	537	1,734	31.0	6,675	3,534	10,209	34.6
2013	1,656	2,073	3,729	55.6	4,035	1,245	5,280	23.6	1,299	600	1,899	31.6	6,990	3,918	10,908	35.9
2014	1,701	1,980	3,681	53.8	4,425	1,362	5,787	23.5	1,296	636	1,932	32.9	7,422	3,978	11,400	34.9
Avg. Growth 2005-14	**3.9%**	**3.5%**	**3.7%**	-	**4.9%**	**4.7%**	**4.8%**	-	**1.8%**	**3.2%**	**2.2%**	-	**4.0%**	**3.8%**	**4.0%**	-

Doctoral:

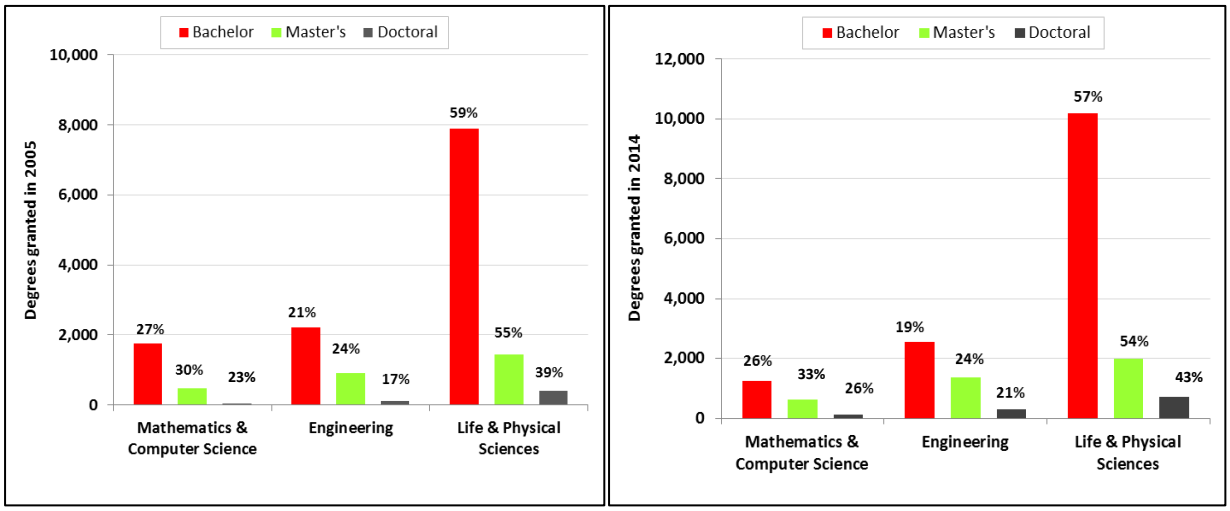
	Life and Physical Sci.				Engineering				Math. and Computer Sci.				NSE Total			
Year	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2005	636	399	1,035	38.6	531	105	636	16.5	171	51	222	23.0	1,338	555	1,893	29.3
2006	684	417	1,101	37.9	609	108	717	15.1	192	48	240	20.0	1,485	573	2,058	27.8
2007	744	552	1,296	42.6	714	129	843	15.3	216	81	297	27.3	1,674	762	2,436	31.3
2008	777	534	1,311	40.7	774	222	996	22.3	258	87	345	25.2	1,809	843	2,652	31.8
2009	864	573	1,437	39.9	855	192	1,047	18.3	276	111	387	28.7	1,995	876	2,871	30.5
2010	897	630	1,527	41.3	882	219	1,101	19.9	309	96	405	23.7	2,088	945	3,033	31.2
2011	897	657	1,554	42.3	876	213	1,089	19.6	300	96	396	24.2	2,073	966	3,039	31.8
2012	927	675	1,602	42.1	906	240	1,146	20.9	309	93	402	23.1	2,142	1,008	3,150	32.0
2013	978	747	1,725	43.3	1,104	243	1,347	18.0	333	111	444	25.0	2,415	1,101	3,516	31.3
2014	960	726	1,686	43.1	1,131	297	1,428	20.8	357	123	480	25.6	2,448	1,146	3,594	31.9
Avg. Growth 2005-14	**4.7%**	**6.9%**	**5.6%**	-	**8.8%**	**12.2%**	**9.4%**	-	**8.5%**	**10.3%**	**8.9%**	-	**6.9%**	**8.4%**	**7.4%**	-

1. Degrees granted to full-time and part-time students.

2. Only includes data for major NSE fields.

Source: Statistics Canada

Figure 2.15 Degrees[1] Granted to Female Students in the NSE in 2005 and 2014—by Major Disciplines and Degree Level



1. Degrees granted to full-time and part-time students.
2. Figures above columns represent percentage of degrees granted to females in each major NSE discipline and at each level of study.
Source: Statistics Canada

2.3 International Comparisons

The lower number of women than men graduating in the NSE is not a phenomenon unique to Canada. Virtually all countries in the world, to varying levels, have fewer women than men studying in the NSE. Table 2.13 presents the number of first university degrees awarded in 2012 (or most recent year) in the NSE as a percentage of the population 20 to 24 years old of the Organisation for Economic Cooperation and Development (OECD) member countries by sex. Figure 2.16 presents the international rankings for the percentage of the female population 20 to 24 years old who earned a first degree in the NSE in 2012, in which Canada placed 12th among the 34 countries included. In contrast, for the male population, the output of NSE first degrees in Canada for those 20 to 24 years old was relatively lower ranked compared with most of the OECD countries, with Canada ranking 25th (see Table 2.13).

Doctoral attainment for the population 30 to 34 years old in 2012 (or most recent year) is provided in Table 2.14 for 29 OECD member countries for which data were available. In comparison with the bachelor's degrees awarded to women in the NSE, at the higher degree level, Canada's position dropped significantly (Figure 2.17), ranking 22nd among the 29 countries. For doctoral degrees earned by men, Canada had a better performance, moving up into the 17th position (see Table 2.14). Once again, the proportion of women with a doctoral degree is considerably lower than the proporition for men for all countries.

Table 2.13 First University Degrees in the NSE and Ratio to Population 20 to 24 Years Old, by Sex, for OECD Member Countries—2012 or Most Recent Year

	No. of First Degrees Granted to Females						No. of First Degrees Granted to Males					
Rank	Country	All fields	NSE	% NSE	No. of Female 20-24 year-olds	NSE as % 20-24 year-olds	Country	All fields	NSE	% NSE	No. of Male 20-24 year-olds	NSE as % 20-24 year-olds
1	New Zealand	23,322	2,641	11.3	154,300	1.71	South Korea	168,867	67,100	39.7	1,777,680	3.77
2	South Korea	156,798	25,094	16.0	1,567,566	1.60	Finland	13,672	5,941	43.5	172,000	3.45
3	Iceland	1,848	175	9.5	11,617	1.51	Japan	311,488	100,671	32.3	3,211,000	3.14
4	Germany	214,054	33,470	15.6	2,346,532	1.43	Germany	172,036	71,600	41.6	2,447,443	2.93
5	Slovenia	7,792	821	10.5	58,071	1.41	New Zealand	14,338	4,186	29.2	156,360	2.68
6	Ireland	15,701	1,827	11.6	139,200	1.31	Slovenia	4,310	1,588	36.8	62,073	2.56
7	Poland	201,512	16,886	8.4	1,341,393	1.26	United Kingdom	168,260	51,487	30.6	2,139,728	2.41
8	United Kingdom	221,036	26,710	12.1	2,123,519	1.26	Iceland	980	292	29.8	12,173	2.40
9	Finland	21,673	2,061	9.5	164,000	1.26	Australia (2011)	80,833	18,629	23.0	823,000	2.26
10	Australia (2011)	115,829	9,424	8.1	788,000	1.20	Poland	117,400	31,172	26.6	1,394,761	2.23
11	Portugal	30,208	3,110	10.3	286,005	1.09	Portugal	20,802	6,437	30.9	290,197	2.22
12	**Canada**	**102,006**	**12,674**	**12.4**	**1,186,864**	**1.07**	Czech Republic	22,352	7,422	33.2	340,159	2.18
13	Czech Republic	37,843	3,471	9.2	325,522	1.07	Spain	88,254	27,150	30.8	1,256,986	2.16
14	United States	1,038,472	116,487	11.2	11,053,750	1.05	Ireland	11,667	2,938	25.2	138,600	2.12
15	Spain	120,707	12,500	10.4	1,216,246	1.03	France	140,315	40,186	28.6	1,937,549	2.07
16	Greece	20,902	3,122	14.9	307,000	1.02	Israel(2011)	19,462	5,719	29.4	297,100	1.92
17	Slovak Republic	23,148	1,878	8.1	192,302	0.98	Slovak Republic	13,115	3,779	28.8	199,762	1.89
18	France	170,711	18,390	10.8	1,908,639	0.96	Austria	15,919	4,867	30.6	270,764	1.80
19	Israel(2011)	27,951	2,696	9.6	287,300	0.94	Netherlands	44,165	8,756	19.8	532,423	1.64
20	Italy	128,282	12,642	9.9	1,544,566	0.82	Hungary	15,083	5,238	34.7	322,528	1.62
21	Austria	22,816	2,105	9.2	262,166	0.80	United States	772,175	185,801	24.1	11,552,150	1.61
22	Estonia	3,082	363	11.8	46,002	0.79	Switzerland	13,317	3,917	29.4	247,912	1.58
23	Sweden	28,155	2,476	8.8	321,776	0.77	Norway	11,288	2,653	23.5	171,000	1.55
24	Denmark	20,144	1,271	6.3	173,615	0.73	Sweden	14,958	5,183	34.7	337,231	1.54
25	Japan	247,204	22,377	9.1	3,061,000	0.73	**Canada**	**66,177**	**19,118**	**28.9**	**1,254,222**	**1.52**
26	Turkey	165,079	22,041	13.4	3,042,905	0.72	Greece	11,907	4,369	36.7	323,000	1.35
27	Norway	18,963	1,004	5.3	164,000	0.61	Mexico	194,700	66,196	34.0	5,079,109	1.30
28	Mexico	231,054	30,943	13.4	5,279,034	0.59	Estonia	1,665	637	38.3	49,087	1.30
29	Hungary	23,373	1,662	7.1	304,978	0.54	Denmark	12,499	2,211	17.7	179,936	1.23
30	Switzerland	15,416	1,125	7.3	240,380	0.47	Belgium	11,419	3,308	29.0	354,075	0.93
31	Netherlands	57,877	2,172	3.8	520,690	0.42	Turkey	175,317	29,248	16.7	3,162,436	0.92
32	Belgium	13,982	1,065	7.6	347,422	0.31	Italy	76,393	12,880	16.9	1,615,507	0.80
33	Chile	32,126	1,719	5.4	725,225	0.24	Chile	24,533	4,428	18.0	746,882	0.59
34	Luxembourg	401	31	7.7	15,924	0.19	Luxembourg	234	45	19.2	16,751	0.27

Source: http://www.nsf.gov/statistics/2016/nsb20161/#/report/chapter-2/international-s-e-higher-education/ & http://stats.oecd.org/population

Figure 2.16 Ratio of Natural Sciences and Engineering First Degrees to Female Population 20 to 24 Years Old, by Country, 2012

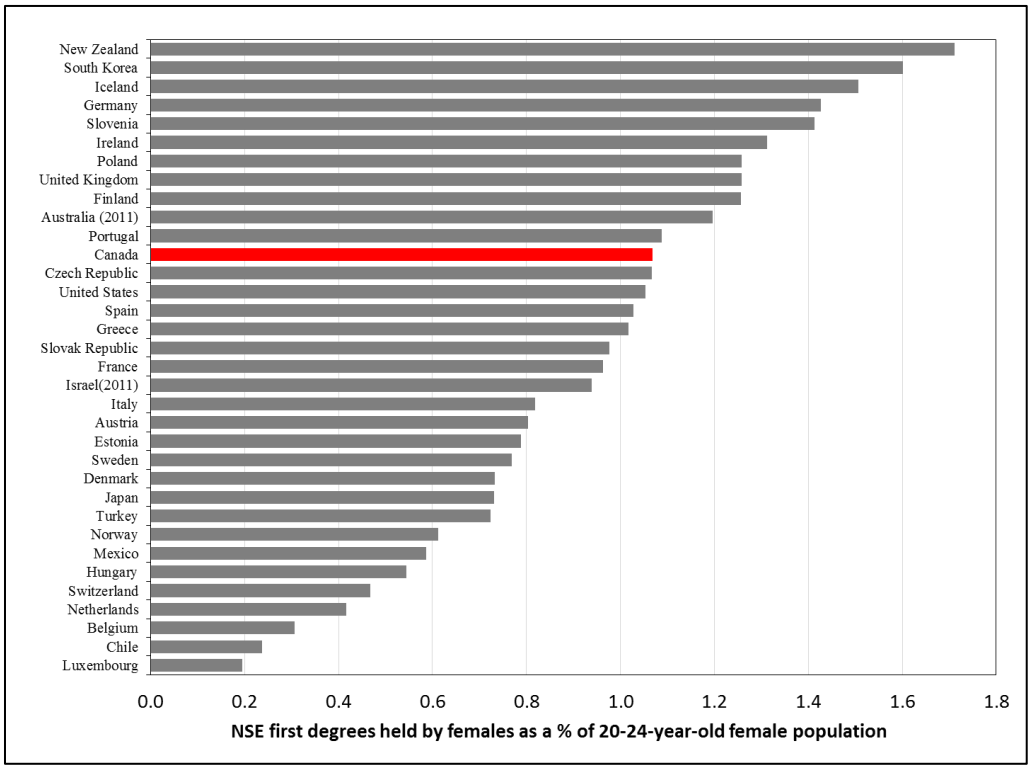


Figure 2.17 Ratio of Natural Sciences and Engineering Doctoral Degrees to Female Population 30 to 34 Years Old, by Country, 2012

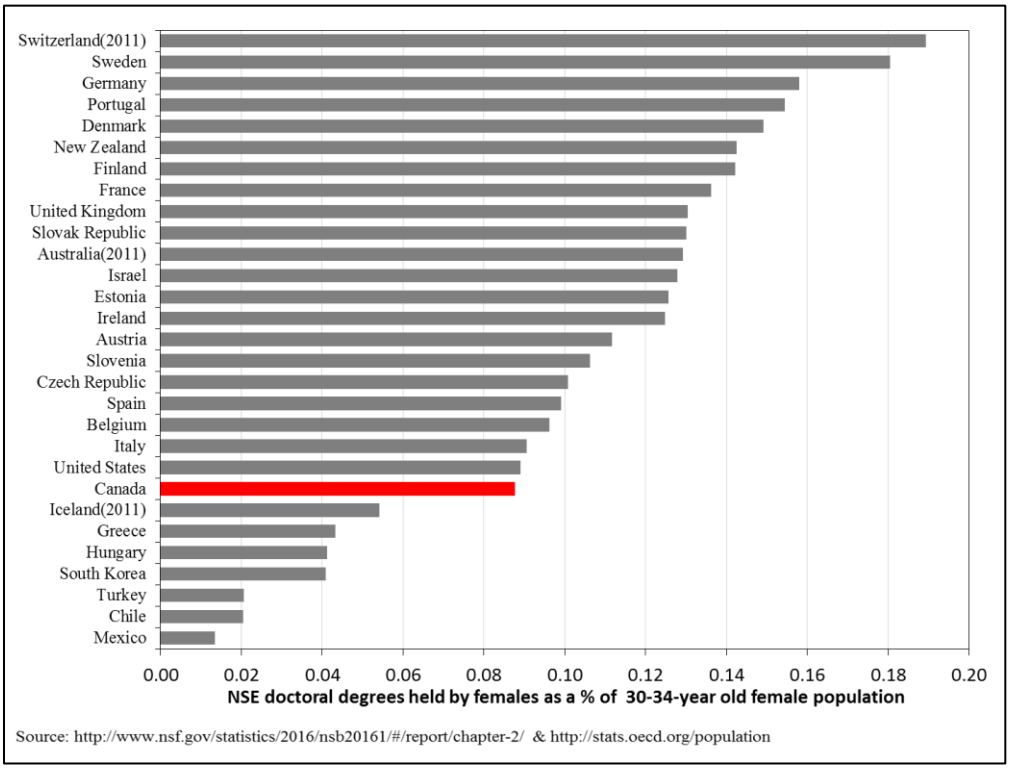


Table 2.14 Doctoral Degrees in the NSE and Ratio to Population 30 to 34 Years Old, by Sex for OECD Member Countries—2012 or Most Recent Year

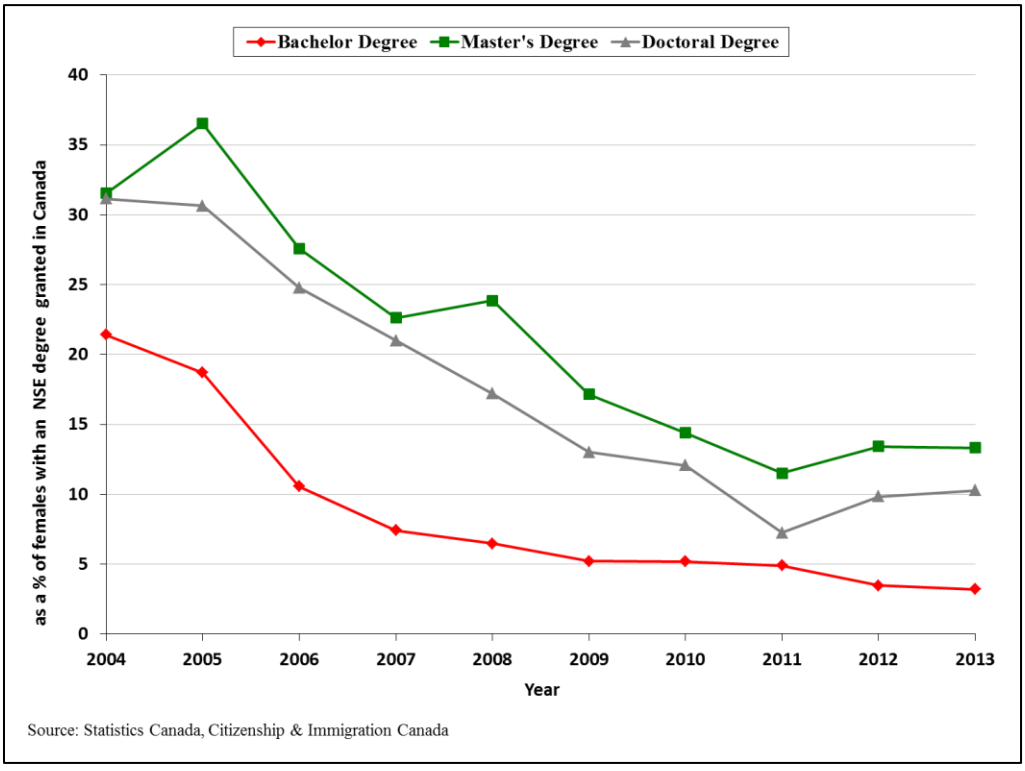
	Ph.D Degrees Granted to Females				No. of Female 30-34-year-olds	NSE as % 30-34-year-olds	Ph.D Degrees Granted to Males				No. of Male 30-34-year-olds	NSE as % 30-34-year-olds
Rank	Country	All fields	NSE	% NSE			Country	All fields	NSE	% NSE		
1	Switzerland(2011)	1,571	509	32.4	268,812	0.189	Switzerland(2011)	2,067	1,027	49.7	272,002	0.378
2	Sweden	1,541	519	33.7	287,660	0.180	Sweden	1,802	989	54.9	300,638	0.329
3	Germany	12,179	3,830	31.4	2,425,235	0.158	Germany	14,628	7,016	48.0	2,456,031	0.286
4	Portugal	1,637	580	35.4	375,623	0.154	Finland	888	449	50.6	176,000	0.255
5	Denmark	703	246	35.0	164,979	0.149	United Kingdom	11,023	5,297	48.1	2,079,036	0.255
6	New Zealand	536	200	37.3	140,280	0.143	Austria	1,403	700	49.9	275,709	0.254
7	Finland	942	236	25.1	166,000	0.142	Denmark	849	416	49.0	165,864	0.251
8	France	5,612	2,746	48.9	2,014,917	0.136	France	7,576	4,839	63.9	1,965,552	0.246
9	United Kingdom	9,415	2,762	29.3	2,117,949	0.130	Slovak Republic	1,118	475	42.5	233,761	0.203
10	Slovak Republic	1,063	288	27.1	221,527	0.130	New Zealand	526	258	49.0	128,030	0.202
11	Australia(2011)	3,259	1,025	31.5	767,000	0.129	Belgium	1,332	731	54.9	371,904	0.197
12	Israel	823	356	43.3	278,300	0.128	Slovenia	282	155	55.0	82,481	0.188
13	Estonia	96	56	58.3	44,553	0.126	Czech Republic	1,571	798	50.8	427,313	0.187
14	Ireland	712	251	35.3	201,000	0.125	Australia(2011)	3,288	1,478	45.0	769,000	0.185
15	Austria	1,009	305	30.2	273,121	0.112	South Korea	8,228	3,743	45.5	2,052,179	0.182
16	Slovenia	287	79	27.5	74,400	0.106	Ireland	735	337	45.9	191,300	0.176
17	Czech Republic	1,112	406	36.5	402,669	0.101	**Canada**	**3,280**	**2,095**	**63.9**	**1,203,520**	**0.174**
18	Spain	4,604	1,834	39.8	1,851,091	0.099	United States	31,304	17,227	55.0	10,492,290	0.164
19	Belgium	1,036	352	34.0	365,855	0.096	Israel	763	447	58.6	276,900	0.161
20	Italy	6,099	1,780	29.2	1,965,255	0.091	Portugal	1,272	572	45.0	357,077	0.160
21	United States	30,767	9,293	30.2	10,435,760	0.089	Estonia	94	59	62.8	47,033	0.125
22	**Canada**	**2,626**	**1,055**	**40.2**	**1,202,799**	**0.088**	Spain	4,879	2,284	46.8	1,928,870	0.118
23	Iceland(2011)	21	6	28.6	11,074	0.054	Iceland(2011)	19	11	57.9	11,501	0.096
24	Greece	761	175	23.0	405,000	0.043	Italy	5,359	1,883	35.1	1,987,342	0.095
25	Hungary	577	150	26.0	364,599	0.041	Greece	973	397	40.8	424,000	0.094
26	South Korea	4,015	797	19.9	1,951,410	0.041	Hungary	665	262	39.4	373,073	0.070
27	Turkey	2,096	666	31.8	3,223,921	0.021	Chile	330	203	61.5	618,745	0.033
28	Chile	208	125	60.1	610,061	0.020	Turkey	2,410	907	37.6	3,296,360	0.028
29	Mexico	2,451	638	26.0	4,725,722	0.014	Mexico	2,668	820	30.7	4,262,729	0.019

Source: http://www.nsf.gov/statistics/2016/nsb20161/#/report/chapter-2/international-s-e-higher-education/ & http://stats.oecd.org/population

2.4 Immigration

Canada has attracted a large number of highly skilled workers with degrees in the NSE (see Table 2.15). The number of skilled immigrant women coming to Canada with degrees in the NSE peaked in 2001 and has fallen considerably in recent years (see Table 2.15). When comparing developing talent in Canada with attracting people through the immigration stream, skilled female immigrants supplemented female Canadian degree recipients by 13 per cent for the master's level and 10 per cent for the doctoral level in 2013 compared with 31 per cent for both master's and doctoral levels in 2004 (Figure 2.18). Although the number of skilled male immigrants with degrees in the NSE has also decreased substantially, they still outnumber women immigrants with NSE degrees. In 2014, the number of male immigrants with professional qualifications suitable for the NSE was 10,995 compared with 1,352 women. This situation further increases the NSE workforce gender gap for the country.

Figure 2.18 Skilled Female Immigrants to Canada with NSE Degrees versus Degrees Granted to Women in Canada in the NSE by Degree Level



Source: Statistics Canada, Citizenship & Immigration Canada

Table 2.15 Immigration to Canada by Education Level and Occupation, 1980–2014 Skilled Immigrant Classification (Applicant–Female), Professional Occupations in the Natural and Applied Sciences[1]

	Level of Education[2]			
Year	Bachelor	Master's	Doctorate	Total
1980	67	18	10	95
1981	108	33	13	154
1982	143	38	16	197
1983	39	11	12	62
1984	33	10	12	55
1985	14	9	10	33
1986	33	14	12	59
1987	159	45	14	218
1988	189	47	19	255
1989	123	41	27	191
1990	152	56	32	240
1991	174	63	39	276
1992	269	64	38	371
1993	476	136	58	670
1994	585	259	81	925
1995	848	360	138	1,346
1996	1,225	492	160	1,877
1997	1,458	663	191	2,312
1998	1,637	546	169	2,352
1999	2,290	875	210	3,375
2000	3,188	1,073	219	4,480
2001	3,700	1,117	242	5,059
2002	3,152	974	209	4,335
2003	3,222	849	148	4,219
2004	2,574	875	171	3,620
2005	2,220	1,034	170	3,424
2006	1,327	797	142	2,266
2007	1,010	637	160	1,807
2008	812	688	145	1,645
2009	636	532	114	1,282
2010	607	483	114	1,204
2011	590	398	70	1,058
2012	428	474	99	1,001
2013	425	522	113	1,060
2014	669	575	108	1,352

[1] Excludes architects, urban planners, and land surveyors.

[2] Excludes levels of education below Bachelor's degree.

Source: Citizenship & Immigration Canada, Research Data Mart as of June 2015.

2.5 Researchers and Scholarly Output

In a recent study by journal publisher Elsevier, *Gender in the Global Research Landscape,*[19] trends in the number of researchers, their scholarly output and collaborations from a gender perspective were published for a selected number of countries, including Canada.

For the purpose of the study, Elsevier used data from Scopus (https://www.scopus.com/), Elsevier's abstract and citation database of over 62 million documents, along with tools that provide information on first names and gender by country, such as Genderize.io (https://genderize.io/), NamSor sociolinguistic analysis (http://www.namsor.com/), and Wikipedia (https://www.wikipedia.org/) name lists to assign a gender to author profiles with a first name.

The dataset covered 27 subject areas[20] (including health and social sciences), and comparisons were made across 12 countries and regions and two five-year time periods: 1996–2000 and 2011–2015. Only researchers who were listed as an author on at least one publication (article, review or conference proceedings) within either of the two five-year periods were considered in the analysis. Table 2.16 presents a summary of a number of the indicators in the report. A few of the interesting trends observed over the time periods include the following:

- growth in the number of female researchers was higher than that for men for all countries;
- growth in the scholarly output per researcher was higher for men compared with women for 11 of the 12 countries/regions studied;
- the field-weighted citation impact was similar for both sexes for most countries, including Canada; and
- men collaborate internationally and with industry at a greater rate than women, but the differences over time are shrinking.

Figure 2.19 depicts the results for Canadian male and female researchers in terms of the number of researchers and their scholarly output for the two periods.

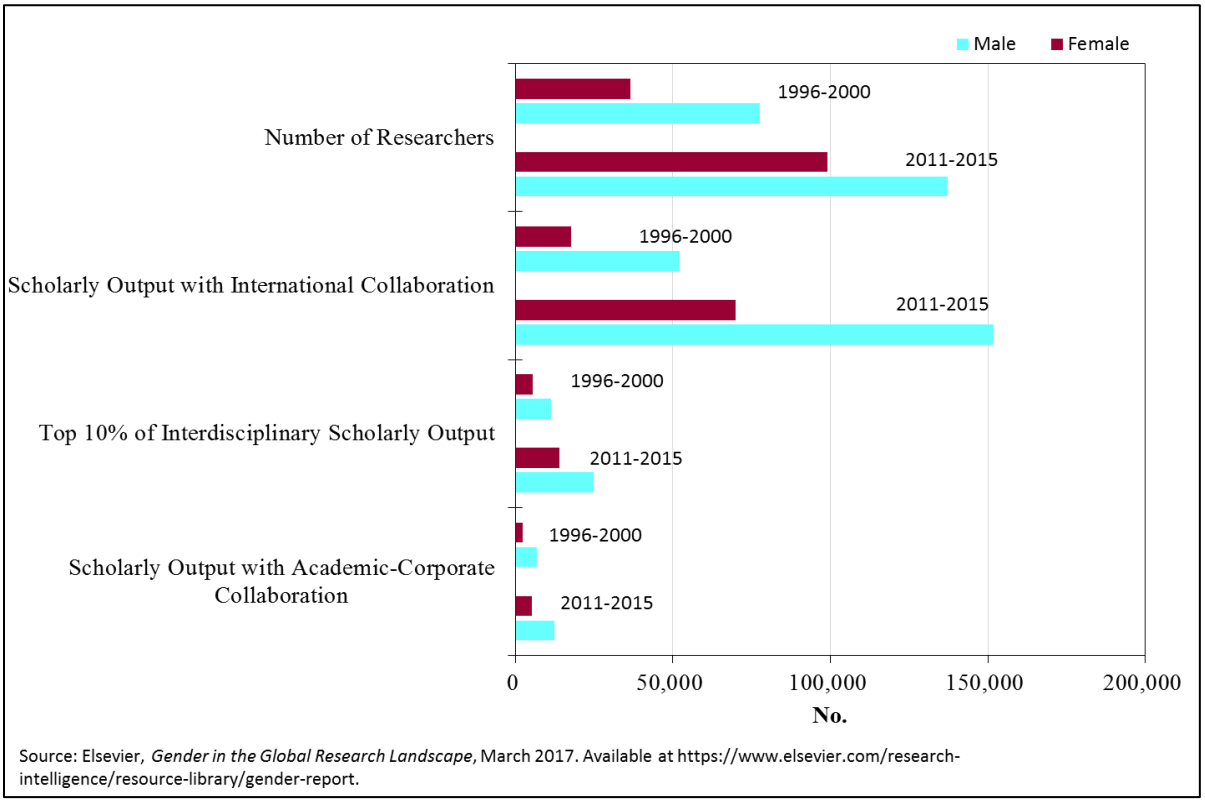
Table 2.17 provides a breakdown of male and female researchers in Canada per subject area in the fields of natural sciences and engineering, health sciences, social sciences and humanities, as well as multidisciplinary fields, over the two periods. It shows that, over these time periods, the growth in

[19] Elsevier, *Gender in the Global Research Landscape*, March 2017, available at https://www.elsevier.com/research-intelligence/resource-library/gender-report.

[20] Titles in Scopus are classified under four broad subject clusters (Life Sciences, Physical Sciences, Health Sciences, and Social & Humanities), which are further divided into the following 27 subject areas (ASJC, All Subject Journal Categories): Multidisciplinary (journals like Nature and Science); Agricultural & Biological Sciences; Arts & Humanities; Biochemistry, Genetics, & Molecular Biology; Business, Management, & Accounting; Chemical Engineering; Chemistry; Computer Science; Decision Sciences; Dentistry; Earth & Planetary Sciences; Economics, Econometrics, & Finance; Energy; Engineering; Environmental Science; Health Professions; Immunology & Microbiology; Materials Science,; Mathematics; Medicine; Neuroscience; Nursing; Pharmacology,Toxicology, & Pharmaceutics; Physics & Astronomy; Psychology; Social Sciences; Veterinary.

the number of women researchers was higher than that for men for all subject areas. The fields of health sciences and social sciences and humanities had nearly equal gender representation during the 2011–2015 period.

Figure 2.19 Number of Researchers in Canada and their Scholarly Output, 1996–2000 vs. 2011–2015, by Sex



Source: Elsevier, *Gender in the Global Research Landscape*, March 2017. Available at https://www.elsevier.com/research-intelligence/resource-library/gender-report.

Table 2.16 Number of Researchers, Scholarly Output, Citation Impact and Collaboration for Selected Countries/Regions, 1996–2000 vs. 2011–2015, by Sex[1]

	Number of Researchers[2]						Scholarly Output per Researcher[3]					
	1996 - 2000		2011 - 2015		Growth[8]		1996 - 2000		2011 - 2015		Growth[8]	
Country/Region	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU28	343,946	732,359	965,025	1,389,772	181%	90%	2.2	2.3	2.0	2.3	-9%	0%
United States	310,666	969,947	705,579	1,071,606	127%	10%	2.0	2.1	1.8	2.0	-10%	-5%
United Kingdom	68,912	154,175	166,481	253,257	142%	64%	2.2	2.4	1.9	2.4	-14%	0%
Canada	**36,539**	**77,569**	**99,055**	**137,259**	**171%**	**77%**	**2.0**	**2.2**	**1.9**	**2.5**	**-5%**	**14%**
Australia	22,632	45,665	75,600	97,908	234%	114%	2.0	2.3	2.2	2.8	10%	22%
France	58,396	114,205	121,948	185,350	109%	62%	2.3	2.3	2.1	2.4	-9%	4%
Brazil	18,171	29,620	153,967	158,873	747%	436%	1.5	1.6	1.2	1.5	-20%	-6%
Japan	49,173	273,604	105,384	411,394	114%	50%	2.3	1.6	1.8	1.3	-22%	-19%
Denmark	7,089	16,984	21,240	30,813	200%	81%	2.2	2.3	2.2	2.8	0%	22%
Portugal	5,134	7,409	27,561	28,935	437%	291%	1.7	1.9	2.0	2.7	18%	42%
Mexico	8,072	15,792	34,410	55,042	326%	249%	1.4	1.5	1.3	1.4	-7%	-7%
Chile	3,021	6,024	13,377	22,099	343%	267%	1.3	1.4	1.3	1.7	0%	21%

	Field-Weighted Citation Impact (FWCI)[4]						Scholarly Output with International Collaboration[5]					
	1996 - 2000		2011 - 2015		Growth[8]		1996 - 2000		2011 - 2015		Growth[8]	
Country/Region	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU28	1.14	1.14	1.28	1.29	12%	13%	102,508	279,909	419,794	825,659	310%	195%
United States	1.61	1.52	1.57	1.52	-2%	0%	84,939	250,643	315,613	653,144	272%	161%
United Kingdom	1.43	1.37	1.64	1.63	15%	19%	34,260	104,394	136,780	296,137	299%	184%
Canada	**1.42**	**1.38**	**1.46**	**1.52**	**3%**	**10%**	**17,655**	**52,178**	**70,040**	**151,861**	**297%**	**191%**
Australia	1.20	1.23	1.52	1.59	27%	29%	9,357	29,046	60,736	124,745	549%	329%
France	1.16	1.17	1.34	1.38	16%	18%	35,311	81,134	106,753	217,894	202%	169%
Brazil	0.65	0.73	0.74	0.81	14%	11%	6,036	12,786	36,610	60,308	507%	372%
Japan	0.91	0.92	0.94	0.96	3%	4%	11,707	59,268	34,888	123,950	198%	109%
Denmark	1.45	1.48	1.75	1.84	21%	24%	4,809	15,103	22,457	47,652	367%	216%
Portugal	0.93	1.00	1.19	1.26	28%	26%	3,175	5,022	22,844	35,100	619%	599%
Mexico	0.65	0.72	0.74	0.84	14%	17%	2,834	7,835	13,762	27,590	386%	252%
Chile	0.75	0.93	0.90	1.12	20%	20%	1,173	3,558	8,170	20,571	597%	478%

	Scholarly Output with Academic-Corporate Collaboration[6]						Top 10% of Interdisciplinary Scholarly Output[7]					
	1996 - 2000		2011 - 2015		Growth[8]		1996 - 2000		2011 - 2015		Growth[8]	
Country/Region	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU28	24,753	57,071	59,600	111,002	141%	94%	68,285	128,128	159,635	253,927	134%	98%
United States	32,751	77,071	59,827	112,482	83%	46%	49,013	99,981	104,210	175,943	113%	76%
United Kingdom	6,135	16,188	13,520	28,433	120%	76%	12,948	28,712	25,019	47,208	93%	64%
Canada	**2,328**	**6,943**	**5,315**	**12,435**	**128%**	**79%**	**5,438**	**11,468**	**14,123**	**24,921**	**160%**	**117%**
Australia	878	2,470	4,216	9,141	380%	270%	3,439	7,094	11,804	20,463	243%	188%
France	5,025	10,664	11,549	22,250	130%	109%	11,845	19,783	18,059	30,916	52%	56%
Brazil	296	714	2,050	3,953	593%	454%	2,681	3,632	18,276	22,070	582%	508%
Japan	6,402	25,733	9,822	31,345	53%	22%	11,733	36,667	17,126	43,517	46%	19%
Denmark	1,029	2,698	3,337	6,620	224%	145%	1,546	3,170	3,762	6,238	143%	97%
Portugal	125	244	908	1,619	626%	564%	654	874	5,488	7,387	739%	745%
Mexico	120	440	599	1,217	399%	177%	943	1,554	4,624	6,987	390%	350%
Chile	40	121	296	917	640%	658%	397	671	1,229	2,278	210%	239%

Source: Elsevier, *Gender in the Global Research Landscape* , March 2017. Available at https://www.elsevier.com/research-intelligence/resource-library/gender-report.

Notes for Table 2.16:

1. Scopus indexes authors with a unique identifier, the Scopus Author ID. This enables the generation of the Scopus Author Profile which identifies all the papers, affiliations, and citations of an author. Since an author's first name field is not mandatory in Scopus, for the purpose of the study, only author profiles with a full first name were included in the gender assignment exercise. The data in this table is from the subset of "named and gendered researchers," i.e those researchers whose Scopus Author Profile contains a first name, and to whom a country of origin and gender were assigned. The Elsevier study reports that the proportion of gendered Scopus Author Profiles across the comparator countries and regions ranges from 80% to 96% for 1996-2000 and 82% to 95% for 2011-2015.

2. Researchers are identified as those authors who list an affiliation in a comparator country or region on at least one paper (article, review, or conference proceeding) across the sources included in Scopus.

3. Total number of papers (articles, reviews and conference proceedings) for the period divided by total number of researchers for that period. All analyses make use of "whole" rather than "fractional" counting. For example, if a paper has been co-authored by one author from the United States and one author from the United Kingdom, then the paper counts towards both paper count for United States, as well as the paper count of the United Kingdom.

4. Field-Weighted Citation Impact (FWCI) is an indicator of mean citation impact, and compares the actual number of citations received by a paper with the expected number of citations for papers of the same document type (article, review, or conference proceeding), publication year, and subject area. Where the paper is classified in two or more subject areas, the harmonic mean of the actual and expected citation rates is used. The indicator is therefore always defined with reference to a global baseline of 1.0 and intrinsically accounts for differences in citation accrual over time, differences in citation rates for different document types (e.g., reviews typically attract more citations than research articles), as well as subject-specific differences in citation frequencies overall and overtime and document types. It is one of the most sophisticated indicators in the modern bibliometric toolkit.

5. Co-authorship of research papers between researchers based is widely used as a proxy for collaboration, and international collaborations can be assessed by taking into account the countries listed in the authors' affiliations in each published paper. While whole rather than fractional counting is applied, the count is deduplicated at aggregated levels (for example, across the European Union). In Elsevier's analysis, international collaboration for the European Union means collaboration between one or more researcher(s) with a European Union affiliation co-authoring with one or more researcher(s) outside the European Union.

6. In Scopus, institutions are classified into one of four main sectors (Corporate, Academic, Government, and Medical sectors). In this report, academic-corporate collaboration is analyzed via the proxy of papers whose authors' affiliations belong to both the academic and corporate sectors.

7. Interdisciplinary research combines two or more academic disciplines into one activity (e.g., a research project). Elsevier uses a citation-based approach to measure interdisciplinarity. The basic principle behind their approach is that, if a paper cites others that are "far away"from it in terms of topic and hence position in the overall citation network, it is likely to be interdisciplinary. The Elsevier study uses this methodology to assign an interdisciplinary score to each paper, and then focus on the top 10% of papers with the highest interdisciplinary scores.

8. Growth from 1996-2000 to 2011-2015.

Table 2.17 Number of Researchers by Discipline and Sex for Canada,[1] 1996–2000 vs. 2011–2015

Subject Areas[2]	1996-2000		2011-2015		Growth[3]		% Women	
	Women	Men	Women	Men	Women	Men	1996-2000	2011-2015
Natural Sciences and Engineering	**31,647**	**106,216**	**100,486**	**225,226**	**218%**	**112%**	**23%**	**31%**
Agricultural & Biological Sciences	5,190	11,834	16,398	22,902	216%	94%	30%	42%
Biochemistry, Genetics, & Molecular Biology	10,606	18,611	28,804	37,182	172%	100%	36%	44%
Chemical Engineering	1,084	4,812	4,199	10,619	287%	121%	18%	28%
Chemistry	2,361	7,018	7,307	16,106	209%	129%	25%	31%
Computer Science	1,141	7,019	6,183	21,245	442%	203%	14%	23%
Earth & Planetary Sciences	1,644	8,195	4,149	11,559	152%	41%	17%	26%
Energy	299	2,287	1,884	8,230	530%	260%	12%	19%
Engineering	2,567	16,194	8,689	31,555	238%	95%	14%	22%
Environmental Science	3,011	9,357	9,144	16,486	204%	76%	24%	36%
Materials Science	1,284	6,635	4,677	15,783	264%	138%	16%	23%
Mathematics	689	4,619	3,507	13,895	409%	201%	13%	20%
Physics & Astronomy	1,771	9,635	5,545	19,664	213%	104%	16%	22%
Health Sciences	**32,716**	**51,389**	**100,443**	**106,412**	**207%**	**107%**	**39%**	**49%**
Dentistry	239	611	530	902	122%	48%	28%	37%
Health Professions	2,024	3,420	5,910	5,824	192%	70%	37%	50%
Immunology & Microbiology	3,588	6,059	8,074	10,267	125%	69%	37%	44%
Medicine	17,198	26,511	59,516	62,360	246%	135%	39%	49%
Neuroscience	3,596	5,678	9,653	11,033	168%	94%	39%	47%
Nursing	2,154	1,665	8,320	5,009	286%	201%	56%	62%
Pharmacology, Toxicology, & Pharmaceutics	3,058	5,892	6,499	8,901	113%	51%	34%	42%
Veterinary	859	1,553	1,941	2,116	126%	36%	36%	48%
Social Sciences and Humanities	**8,948**	**14,484**	**40,444**	**43,910**	**352%**	**203%**	**38%**	**48%**
Arts & Humanities	579	1,103	8,056	8,944	1291%	711%	34%	47%
Business, Management, & Accounting	588	1,595	2,416	4,326	311%	171%	27%	36%
Decision Sciences	197	968	967	2,894	391%	199%	17%	25%
Economics, Econometrics, & Finance	412	1,295	1,282	3,114	211%	140%	24%	29%
Psychology	3,373	3,685	9,884	6,693	193%	82%	48%	60%
Social Sciences	3,799	5,838	17,839	17,939	370%	207%	39%	50%
Multidisciplinary	**542**	**1,613**	**1,979**	**4,188**	**265%**	**160%**	25%	32%

Source: Elsevier, *Gender in the Global Research Landscape* , March 2017.
Available at https://www.elsevier.com/research-intelligence/resource-library/gender-report.

1. See notes for Table 2.16

2. Publication titles in Elsevier's Scopus database are classified under four broad subject clusters (Life Sciences, Physical Sciences, Health Sciences, and Social Sciences & Humanities), which are further divided into 27 major subject areas (ASJC, All Subject Journal Categories).

3. Growth from 1996-2000 to 2011-2015.

3. Career Outcomes

This section examines the labour force participation and occupations of women and men holding degrees in the NSE. More than 1 million Canadians are employed in an occupation related to the NSE. Figure 3.1 presents the number of women in natural and applied sciences and related occupations, and their share of the total from 2000 to 2015. Over this 15-year period, the percentage of women holding NSE-related occupations has increased from 20.9 per cent to 23.2 per cent. Among the population of working women in 2015, 3.8 per cent held an NSE-related position compared with 11.4 per cent for men (see Figure 3.2). Unemployment rates for women and men in NSE occupations are presented in Figure 3.3; the rates for women and men follow a similar pattern.

Figure 3.1 Number of Female Workers (Aged 15 Years and Over) in Natural and Applied Sciences and Related Occupations, 2000–2015

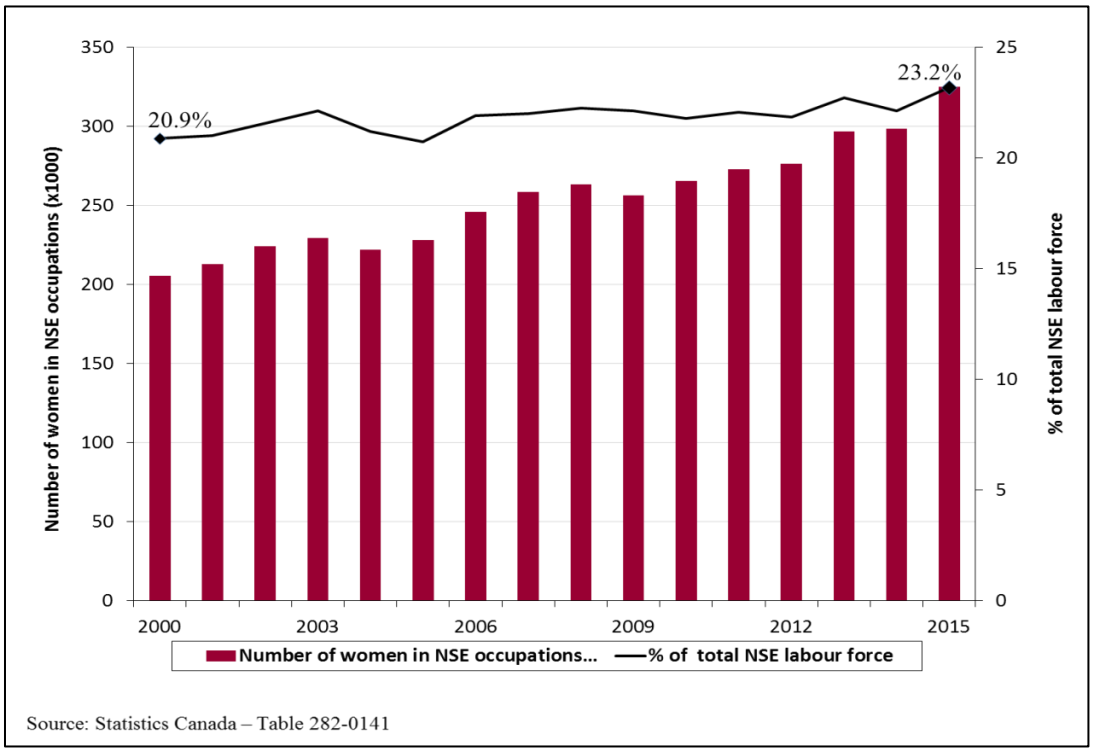
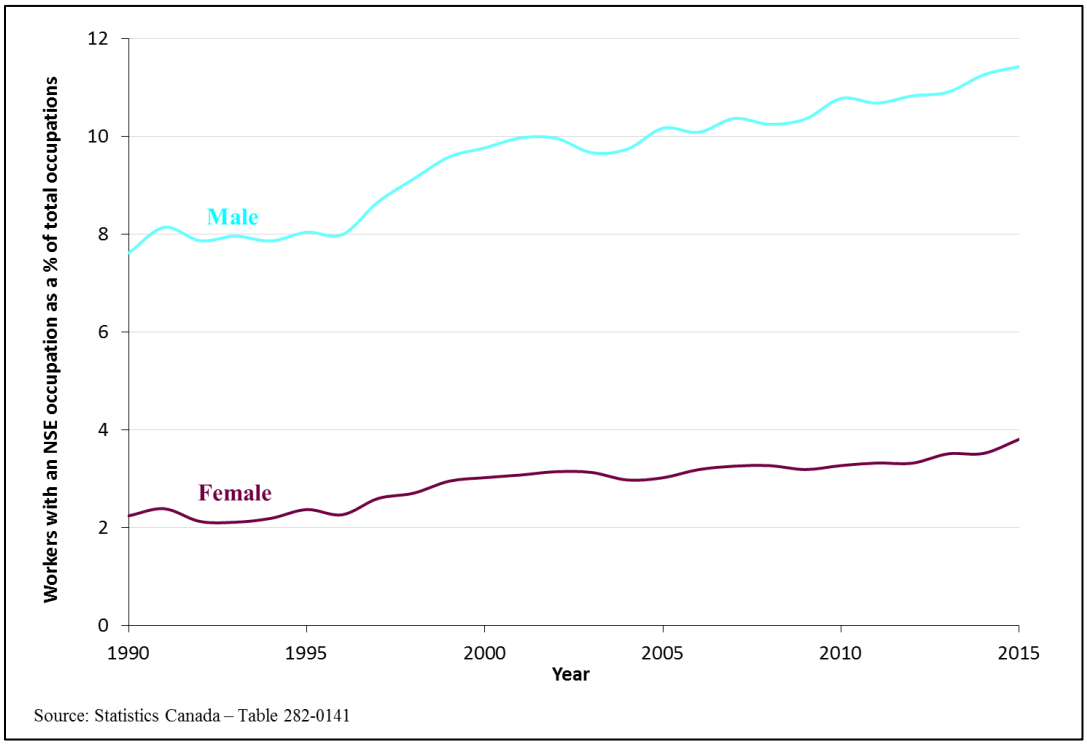
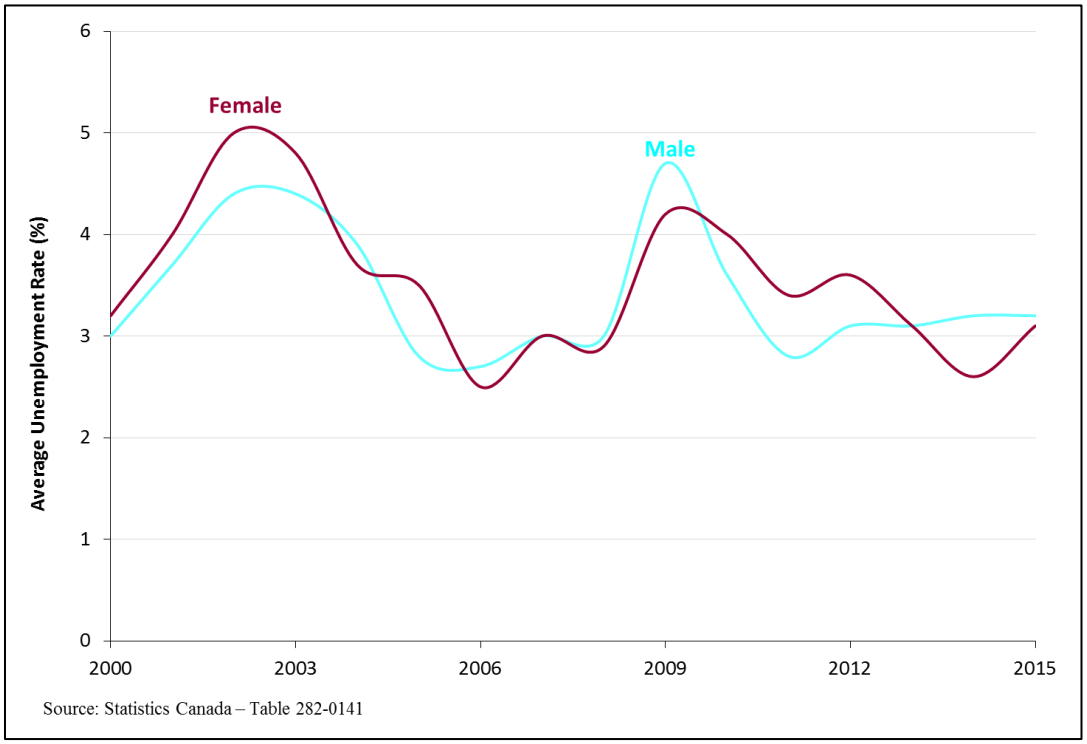


Figure 3.2 Workers (Aged 15 years and Over) with Natural Sciences and Related Occupations as a Percentage of Total Occupations—by Sex, 1990–2015



Source: Statistics Canada – Table 282-0141

Figure 3.3 Unemployment Rate in the Natural and Applied Sciences and Related Occupations (Workers Aged 15 years and Over)—by Sex, 2000–2015



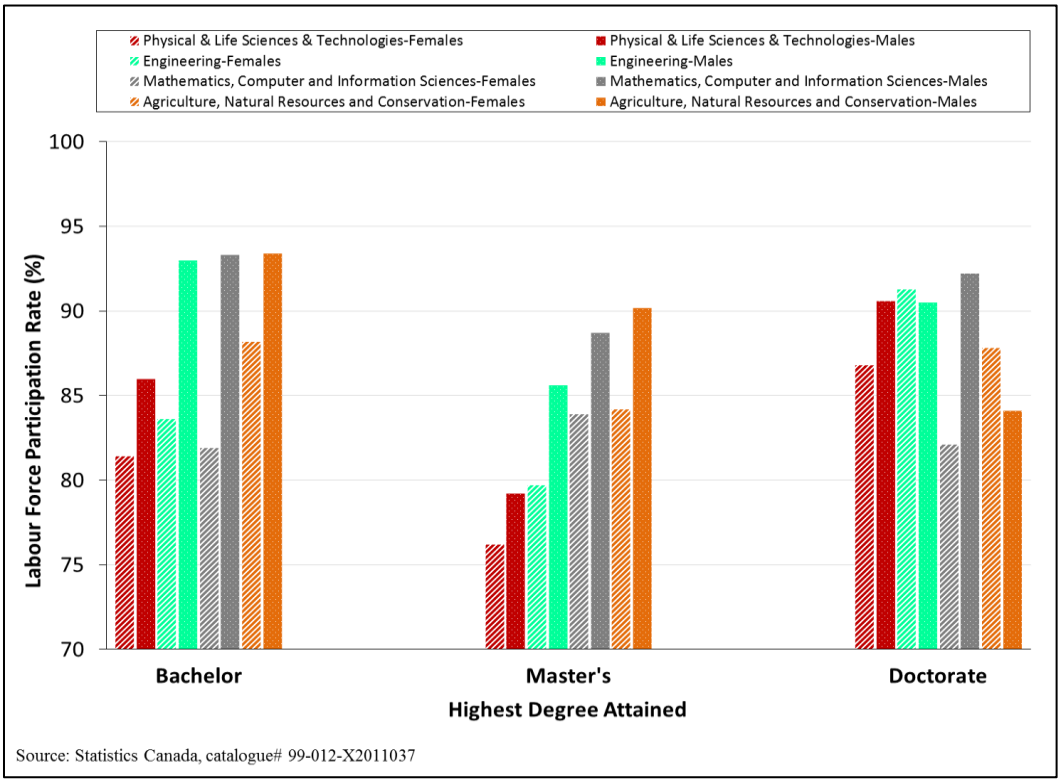
Source: Statistics Canada – Table 282-0141

3.1 Labour Force Participation of Young Graduates (25–34 Years Old) in the NSE

Statistics Canada's 2011 National Household Survey captured detailed information about the highest degree earned, the field of study and labour force status of Canadians. Data are presented comparing the labour force participation of young women and men graduating in different major fields of the NSE and at different degree levels (bachelor's, master's and doctoral). The 25–34 age group was selected to provide a better indication of more recent labour force outcomes.

Data from the 2011 survey (Table 3.1 and Figure 3.4) indicate that, in general, young male NSE graduates had a higher participation rate in the labour force compared with young female graduates. The lower labour force participation rates of women eventually translate into fewer women in NSE-related occupations.

Figure 3.4 Labour Force Participation of University Graduates in NSE, Aged 25–34—by Sex, Major Fields of Study and Degree Level—2011



Source: Statistics Canada, catalogue# 99-012-X2011037

Table 3.1 Labour Force Participation in 2011 by Sex, Ages 25–34, by Major Field of Study and Degree Level

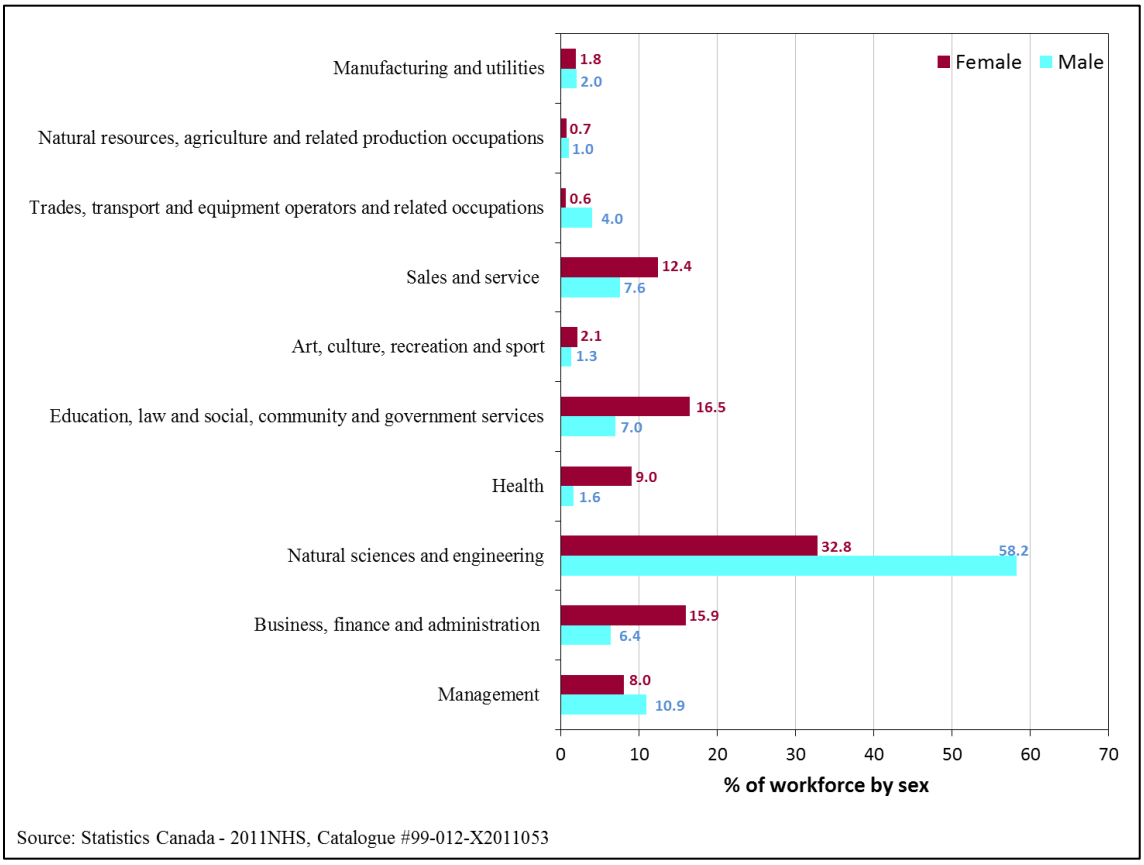
		Degree Level					
		Bachelor		Master's		Doctorate	
Major Field of Study	Labour Force Status	Male	Female	Male	Female	Male	Female
Physical and life sciences and technologies	Total	26,430	38,800	9,240	13,545	4,405	3,480
	In the labour force	22,730	31,570	7,315	10,315	3,990	3,020
	Employed	21,305	29,520	6,795	9,545	3,845	2,890
	Unemployed	1,420	2,055	515	775	145	135
	Not in the labour force	3,695	7,230	1,925	3,225	415	455
	Participation Rate (%)	86.0	81.4	79.2	76.2	90.6	86.8
	Employment Rate (%)	80.6	76.1	73.5	70.5	87.3	83.0
	Unemployment Rate (%)	6.2	6.5	7.0	7.5	3.6	4.5
Engineering	Total	69,910	19,770	17,755	6,370	2,645	750
	In the labour force	65,020	16,520	15,195	5,080	2,395	685
	Employed	62,530	15,395	14,350	4,740	2,270	635
	Unemployed	2,490	1,125	845	335	125	45
	Not in the labour force	4,885	3,250	2,555	1,295	250	70
	Participation Rate (%)	93.0	83.6	85.6	79.7	90.5	91.3
	Employment Rate (%)	89.4	77.9	80.8	74.4	85.8	84.7
	Unemployment Rate (%)	3.8	6.8	5.6	6.6	5.2	6.6
Mathematics, computer and information sciences	Total	35,260	13,585	9,590	7,085	1,150	335
	In the labour force	32,905	11,120	8,505	5,945	1,060	275
	Employed	31,660	10,275	8,010	5,320	1,030	250
	Unemployed	1,250	850	495	625	35	25
	Not in the labour force	2,350	2,470	1,080	1,140	85	55
	Participation Rate (%)	93.3	81.9	88.7	83.9	92.2	82.1
	Employment Rate (%)	89.8	75.6	83.5	75.1	89.6	74.6
	Unemployment Rate (%)	3.8	7.6	5.8	10.5	3.3	9.1
Agriculture, natural resources and conservation	Total	7,160	8,420	2,490	3,935	315	205
	In the labour force	6,690	7,425	2,245	3,315	265	180
	Employed	6,300	6,915	2,040	3,065	250	140
	Unemployed	395	505	200	250	0	35
	Not in the labour force	465	995	245	620	50	30
	Participation Rate (%)	93.4	88.2	90.2	84.2	84.1	87.8
	Employment Rate (%)	88.0	82.1	81.9	77.9	79.4	68.3
	Unemployment Rate (%)	5.9	6.8	8.9	7.5	0.0	19.4

Source: Statistics Canada, catalogue # 99-012-X2011037

Figures 3.5 to 3.7 present the occupational distributions of male and female workers aged 25 to 34 with bachelor, master's and doctoral degrees in the NSE for the 10 major occupation groups. Tables 3.2 to 3.4 present the same data broken down by the three major NSE fields. Some observed trends include:

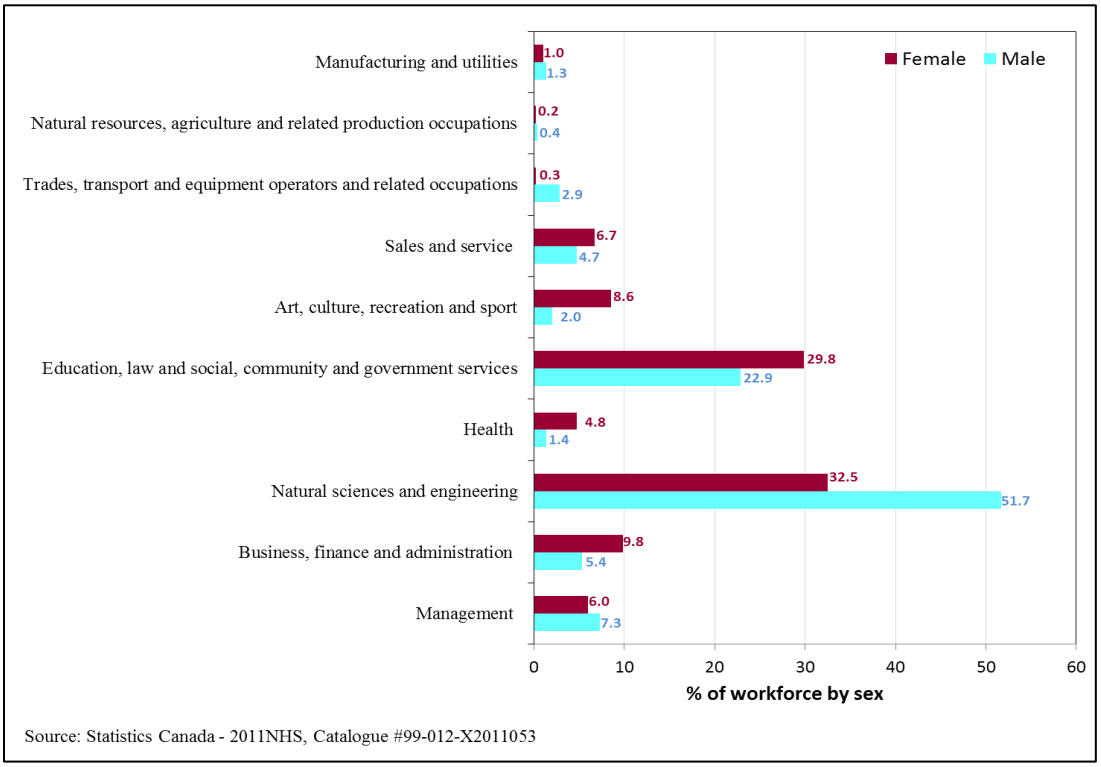
- the differences in the occupational distributions for women and men decrease as the degree qualifications increase; and
- men tend to occupy positions more concentrated in the natural and applied sciences at all degree levels.

Figure 3.5 Occupation Distribution of Bachelor Degree Holders 25 to 34 Years of Age in the NSE—by Sex, 2011



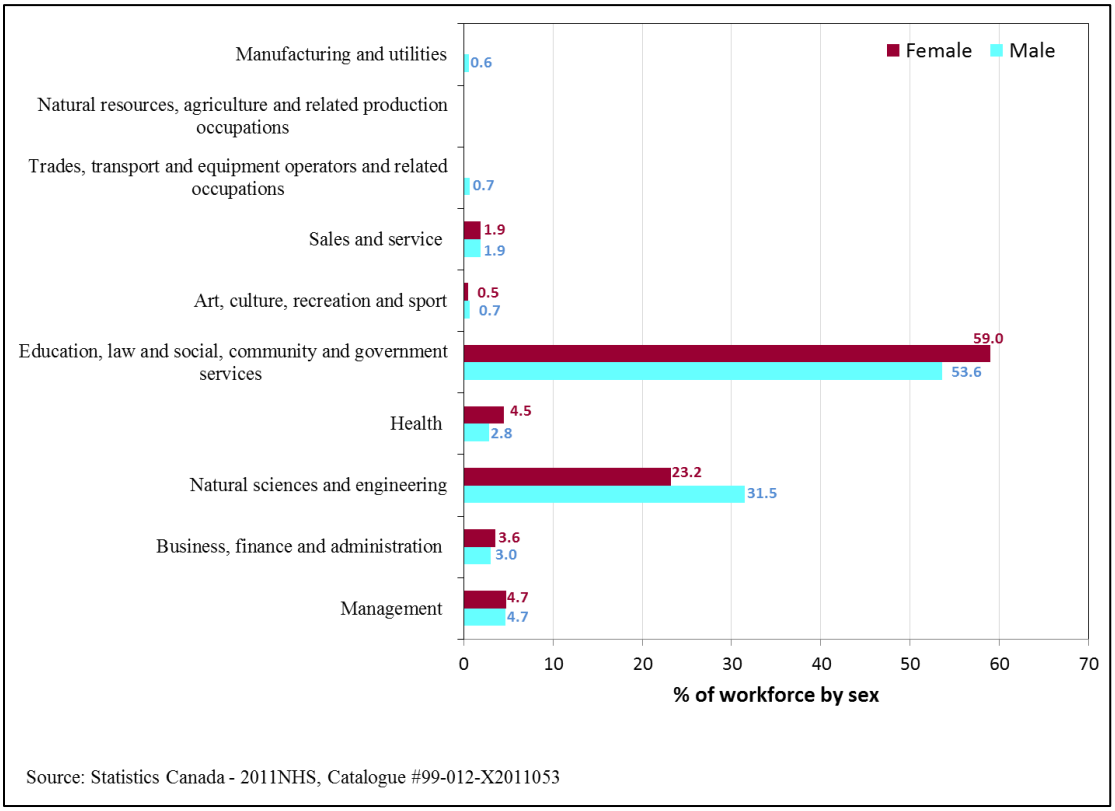
Source: Statistics Canada - 2011NHS, Catalogue #99-012-X2011053

Figure 3.6 Occupation Distribution of Master's Degree Holders 25–34 Years Old in the NSE—by Sex, 2011



Source: Statistics Canada - 2011NHS, Catalogue #99-012-X2011053

Figure 3.7 Occupation Distribution of Doctoral Degree Holders 25–34 Years Old in the NSE—by Sex, 2011



Source: Statistics Canada - 2011NHS, Catalogue #99-012-X2011053

Table 3.2 Occupations of Bachelor Graduates (25–34 Years Old) in the NSE, 2011

	Physical and Life Sci. & Technologies		Engineering		Maths, Computer & Information Sci.		Agriculture, Nat. Resources & Cons.		NSE Total	
Occupation	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Total - Occupations	**21,310**	**29,515**	**62,530**	**15,395**	**31,660**	**10,270**	**6,295**	**6,915**	**121,795**	**62,095**
Management	2,530	2,000	6,545	1,305	3,115	795	1,130	885	13,320	4,985
Business, finance and administration	1,980	5,120	2,925	1,575	2,425	2,270	405	925	7,735	9,890
Natural sciences and engineering	6,460	5,685	41,785	8,830	20,590	3,755	2,065	2,120	70,900	20,390
Health	1,435	4,895	280	300	155	165	90	240	1,960	5,600
Education, law and social, community and government	3,790	6,255	2,380	1,350	1,500	1,395	815	1,245	8,485	10,245
Art, culture, recreation and sport	490	755	505	145	520	225	55	190	1,570	1,315
Sales and service	2,845	4,025	3,605	1,370	2,085	1,450	700	850	9,235	7,695
Trades, transport and equipment operators and related	980	135	2,635	120	860	50	390	70	4,865	375
Natural resources, agriculture and related production	375	185	365	35	135	0	375	205	1,250	425
Manufacturing and utilities	425	460	1,495	365	275	145	275	175	2,470	1,145
					% of Total					
Management	11.9	6.8	10.5	8.5	9.8	7.7	18.0	12.8	10.9	8.0
Business, finance and administration	9.3	17.3	4.7	10.2	7.7	22.1	6.4	13.4	6.4	15.9
Natural sciences and engineering	30.3	19.3	66.8	57.4	65.0	36.6	32.8	30.7	58.2	32.8
Health	6.7	16.6	0.4	1.9	0.5	1.6	1.4	3.5	1.6	9.0
Education, law and social, community and government	17.8	21.2	3.8	8.8	4.7	13.6	12.9	18.0	7.0	16.5
Art, culture, recreation and sport	2.3	2.6	0.8	0.9	1.6	2.2	0.9	2.7	1.3	2.1
Sales and service	13.4	13.6	5.8	8.9	6.6	14.1	11.1	12.3	7.6	12.4
Trades, transport and equipment operators and related	4.6	0.5	4.2	0.8	2.7	0.5	6.2	1.0	4.0	0.6
Natural resources, agriculture and related production	1.8	0.6	0.6	0.2	0.4	0.0	6.0	3.0	1.0	0.7
Manufacturing and utilities	2.0	1.6	2.4	2.4	0.9	1.4	4.4	2.5	2.0	1.8

Source: Statistics Canada-2011 National Household Survey. Catalogue # 99-012-X2011053

Table 3.3 Occupations of Master's Graduates (25–34 Years Old) in the NSE, 2011

	Physical and Life Sci. & Technologies		Engineering		Maths, Computer & Information Sci.		Agriculture, Nat. Resources & Cons.		NSE Total	
Occupation	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Total - Occupations	**6,795**	**9,545**	**14,355**	**4,745**	**8,015**	**5,325**	**2,045**	**3,065**	**31,210**	**22,680**
Management	425	385	1,065	355	570	340	230	280	2,290	1,360
Business, finance and administration	385	825	630	375	490	660	165	370	1,670	2,230
Natural sciences and engineering	2,240	2,640	8,500	2,495	4,750	1,380	640	865	16,130	7,380
Health	295	855	80	70	35	90	25	65	435	1,080
Education, law and social, community and government	2,730	3,815	2,530	950	1,215	845	670	1,155	7,145	6,765
Art, culture, recreation and sport	110	175	120	95	355	1,590	45	80	630	1,940
Sales and service	400	720	670	290	325	350	85	160	1,480	1,520
Trades, transport and equipment operators and related	100	0	485	60	200	0	110	0	895	60
Natural resources, agriculture and related production	20	25	70	0	0	0	40	30	130	55
Manufacturing and utilities	85	85	210	55	80	40	45	50	420	230
					% of Total					
Management	6.3	4.0	7.4	7.5	7.1	6.4	7.1	9.1	7.3	6.0
Business, finance and administration	5.7	8.6	4.4	7.9	6.1	12.4	6.1	12.1	5.4	9.8
Natural sciences and engineering	33.0	27.7	59.2	52.6	59.3	25.9	59.3	28.2	51.7	32.5
Health	4.3	9.0	0.6	1.5	0.4	1.7	0.4	2.1	1.4	4.8
Education, law and social, community and government	40.2	40.0	17.6	20.0	15.2	15.9	15.2	37.7	22.9	29.8
Art, culture, recreation and sport	1.6	1.8	0.8	2.0	4.4	29.9	4.4	2.6	2.0	8.6
Sales and service	5.9	7.5	4.7	6.1	4.1	6.6	4.1	5.2	4.7	6.7
Trades, transport and equipment operators and related	1.5	0.0	3.4	1.3	2.5	0.0	2.5	0.0	2.9	0.3
Natural resources, agriculture and related production	0.3	0.3	0.5	0.0	0.0	0.0	0.0	1.0	0.4	0.2
Manufacturing and utilities	1.3	0.9	1.5	1.2	1.0	0.8	1.0	1.6	1.3	1.0

Source: Statistics Canada-2011 National Household Survey. Catalogue # 99-012-X2011053

Table 3.4 Occupations of Doctoral Graduates (25–34 Years Old) in the NSE, 2011

	Physical and Life Sci. & Technologies		Engineering		Maths, Computer & Information Sci.		Agriculture, Nat. Resources & Cons.		NSE Total	
Occupation	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Total - Occupations	**3,845**	**2,885**	**2,270**	**640**	**1,025**	**250**	**250**	**140**	**7,390**	**3,915**
Management	195	150	100	35	50	0	0	0	345	185
Business, finance and administration	140	65	60	50	25	25	0	0	225	140
Natural sciences and engineering	1,010	615	945	215	325	35	45	45	2,325	910
Health	165	175	45	0	0	0	0	0	210	175
Education, law and social, community and government services	2,210	1,775	1,010	315	570	155	170	65	3,960	2,310
Art, culture, recreation and sport	30	20	20	0	0	0	0	0	50	20
Sales and service	60	75	50	0	30	0	0	0	140	75
Trades, transport and equipment operators and related	20	0	30	0	0	0	0	0	50	0
Natural resources, agriculture and related production	0	0	0	0	0	0	0	0	0	0
Manufacturing and utilities	20	0	10	0	15	0	0	0	45	0
	% of Total									
Management	5.1	5.2	4.4	5.5	4.9	0.0	0.0	0.0	4.7	4.7
Business, finance and administration	3.6	2.3	2.6	7.8	2.4	10.0	0.0	0.0	3.0	3.6
Natural sciences and engineering	26.3	21.3	41.6	33.6	31.7	14.0	18.0	32.1	31.5	23.2
Health	4.3	6.1	2.0	0.0	0.0	0.0	0.0	0.0	2.8	4.5
Education, law and social, community and government services	57.5	61.5	44.5	49.2	55.6	62.0	68.0	46.4	53.6	59.0
Art, culture, recreation and sport	0.8	0.7	0.9	0.0	0.0	0.0	0.0	0.0	0.7	0.5
Sales and service	1.6	2.6	2.2	0.0	2.9	0.0	0.0	0.0	1.9	1.9
Trades, transport and equipment operators and related	0.5	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.7	0.0
Natural resources, agriculture and related production	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacturing and utilities	0.5	0.0	0.4	0.0	1.5	0.0	0.0	0.0	0.6	0.0

Source: Statistics Canada-2011 National Household Survey. Catalogue # 99-012-X2011053

The 2011 National Household Survey provided an insight into the earnings of university graduates in 2010. As shown in Table 3.5, employment earnings were generally higher for men. For example, among graduates employed full-time in NSE-related occupations, the median earnings for men were $77,531, compared with $66,746 for women.

Table 3.5 Median Earnings of Full-Time, Full-Year Employed University Graduates, by Major Occupational Groups, 2010

Occupation	Median Income ($ Cdn.)		
	Women	Men	Ratio
Management	78,299	93,159	0.84
Business, finance and administration	51,215	65,714	0.78
Natural sciences and engineering	66,746	77,531	0.86
Health	69,615	86,742	0.80
Education, law and social, community and government services	64,177	74,493	0.86
Art, culture, recreation and sport	45,217	46,534	0.97
Sales and service	35,508	44,883	0.79
Trades, transport and equipment operators and related occupations	45,545	45,711	1.00
Natural resources, agriculture and related production occupations	28,947	49,992	0.58
Manufacturing and utilities	37,363	51,387	0.73

Source: Statistics Canada-NHS 2011-Table 99-014-X2011042

3.2 Research Careers

The careers of NSE graduates in research are of particular interest to NSERC, especially the outcomes for doctoral degree holders. A significant percentage of doctoral degree holders in the NSE are able to secure positions in postsecondary teaching and research.

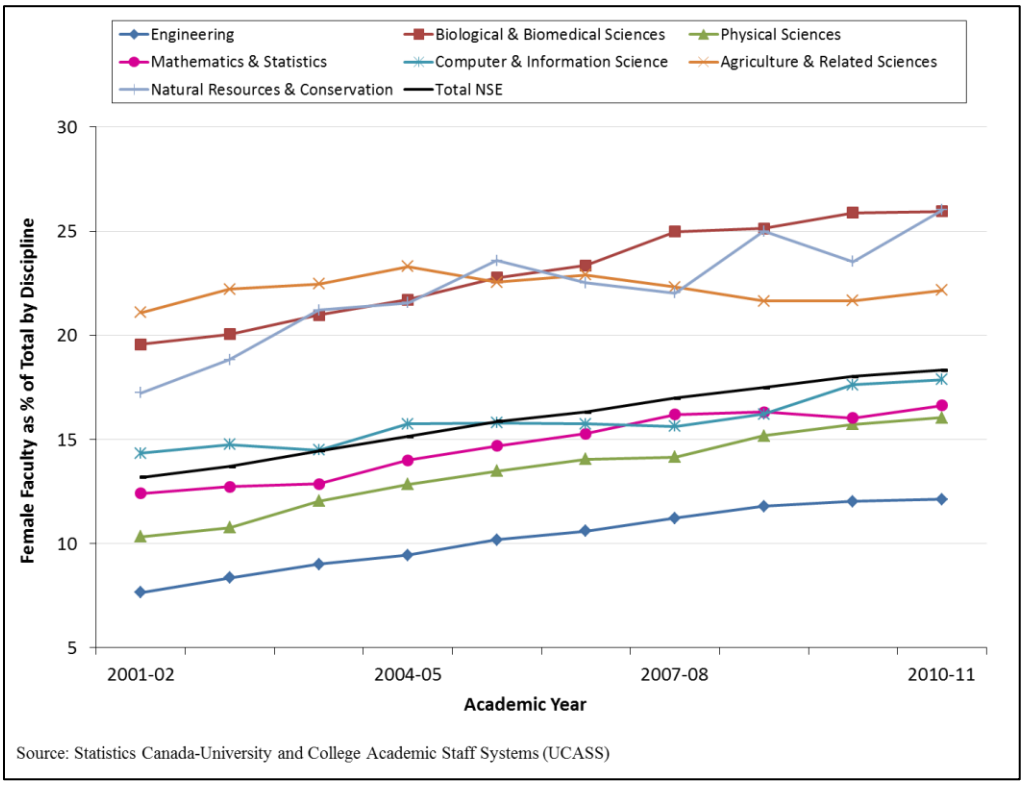
Data by sector of employment related to research careers are presented, along with the early career outcomes of former NSERC scholarship and fellowship recipients.

Academic Sector

The most recent Canadian university faculty data available are for the academic year 2010–11 due to the temporary discontinuation of the University and College Academic Staff System annual survey conducted by Statistics Canada. The survey has recently been reinstated, and new data are expected in 2017.

The share of women in NSE disciplines working full-time as full, associate or assistant professors remains low, as shown in Figure 3.8 and Table 3.6. In 2010–11, there were 2,223 female faculty in the NSE, representing 18.3 per cent of the NSE total. Figure 3.8 illustrates the wide variation in the share of full-time professors who are women across the various NSE disciplines. The share of female faculty in 2010 was the lowest in engineering (12.1 per cent), but considerably higher in biological and biomedical sciences (26.0 per cent), natural resources and conservation (26.0 per cent) and agriculture (22.2 per cent).

Figure 3.8 Full-Time Female Faculty in the NSE as a Percentage of Total NSE Faculty by Discipline



Source: Statistics Canada-University and College Academic Staff Systems (UCASS)

An examination of full-time faculty positions by rank (Figure 3.9) indicates that the distribution of women faculty is skewed towards lower-ranking academic positions, such as lecturers/instructors, which fall under the "other" category. In 2010–11, women represented 12.5 per cent of all full professors in the NSE but 28 per cent of those at the assistant professor level. Figure 3.10 illustrates the percentage of female faculty by rank in the NSE and by major discipline.

Table 3.6 Full-Time Faculty in Positions of Full Professor, Associate Professor and Assistant Professor in the NSE, 2000–01 to 2010–11

Academic Year	Engineering				Biological and Biomedical Sciences				Physical Sciences				Mathematics and Statistics			
	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2000-01	2,292	177	2,469	7.2	1,995	450	2,445	18.4	1,797	189	1,986	9.5	1,140	150	1,290	11.6
2001-02	2,391	198	2,589	7.6	1,998	486	2,484	19.6	1,797	207	2,004	10.3	1,164	165	1,329	12.4
2002-03	2,532	231	2,763	8.4	2,034	510	2,544	20.0	1,791	216	2,007	10.8	1,152	168	1,320	12.7
2003-04	2,574	255	2,829	9.0	2,091	555	2,646	21.0	1,818	249	2,067	12.0	1,179	174	1,353	12.9
2004-05	2,673	279	2,952	9.5	2,055	570	2,625	21.7	1,833	270	2,103	12.8	1,179	192	1,371	14.0
2005-06	2,700	306	3,006	10.2	2,097	618	2,715	22.8	1,830	285	2,115	13.5	1,167	201	1,368	14.7
2006-07	2,760	327	3,087	10.6	2,175	663	2,838	23.4	1,872	306	2,178	14.0	1,182	213	1,395	15.3
2007-08	2,778	351	3,129	11.2	2,172	723	2,895	25.0	1,893	312	2,205	14.1	1,164	225	1,389	16.2
2008-09	2,829	378	3,207	11.8	2,190	735	2,925	25.1	1,878	336	2,214	15.2	1,170	228	1,398	16.3
2009-10	2,919	399	3,318	12.0	2,346	819	3,165	25.9	1,944	363	2,307	15.7	1,179	225	1,404	16.0
2010-11	2,958	408	3,366	12.1	2,337	819	3,156	26.0	1,914	366	2,280	16.1	1,158	231	1,389	16.6

Academic Year	Computer and Information				Agriculture, Agriculture Operations				Natural Resources and				NSE Total			
	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female	Male	Female	Total	% Female
2000-01	732	120	852	14.1	315	78	393	19.8	177	39	216	18.1	8,448	1,203	9,651	12.5
2001-02	807	135	942	14.3	303	81	384	21.1	216	45	261	17.2	8,676	1,317	9,993	13.2
2002-03	849	147	996	14.8	315	90	405	22.2	207	48	255	18.8	8,880	1,410	10,290	13.7
2003-04	921	156	1,077	14.5	321	93	414	22.5	234	63	297	21.2	9,138	1,545	10,683	14.5
2004-05	963	180	1,143	15.7	306	93	399	23.3	240	66	306	21.6	9,249	1,650	10,899	15.1
2005-06	960	180	1,140	15.8	309	90	399	22.6	243	75	318	23.6	9,306	1,755	11,061	15.9
2006-07	963	180	1,143	15.7	303	90	393	22.9	258	75	333	22.5	9,513	1,854	11,367	16.3
2007-08	939	174	1,113	15.6	303	87	390	22.3	276	78	354	22.0	9,525	1,950	11,475	17.0
2008-09	930	180	1,110	16.2	315	87	402	21.6	252	84	336	25.0	9,564	2,028	11,592	17.5
2009-10	912	195	1,107	17.6	369	102	471	21.7	273	84	357	23.5	9,942	2,187	12,129	18.0
2010-11	882	192	1,074	17.9	390	111	501	22.2	273	96	369	26.0	9,912	2,223	12,135	18.3

Source: Statistics Canada

Figure 3.9 Full-Time Female Faculty in the NSE as a Percentage of Total NSE Faculty by Rank

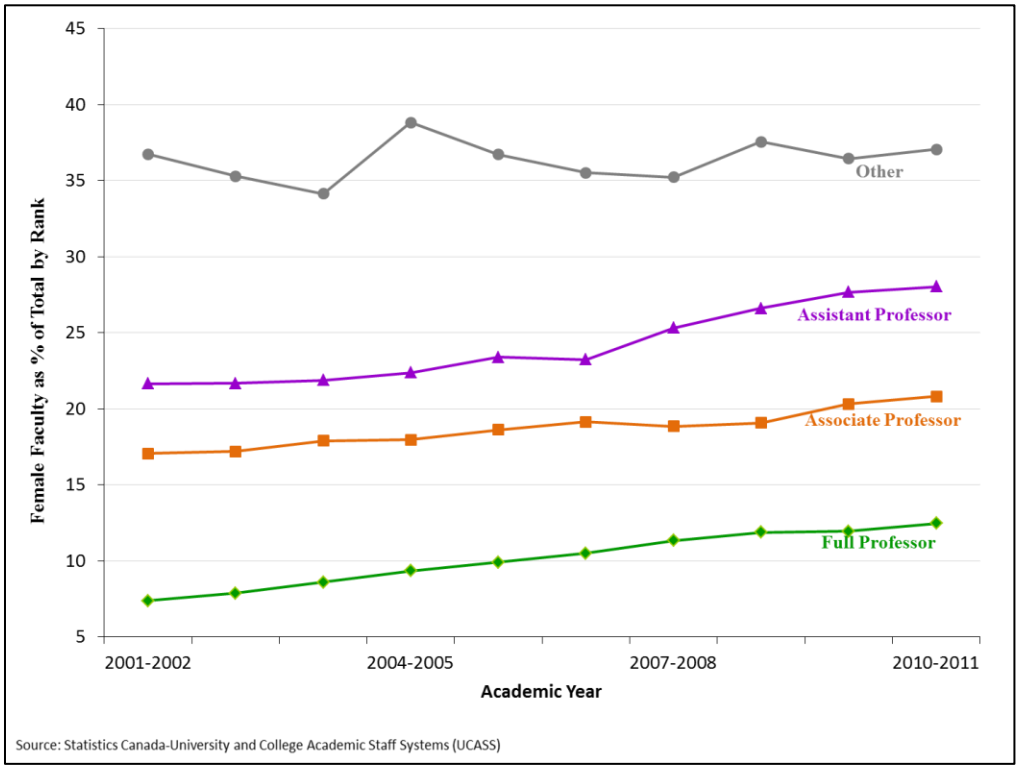


Figure 3.10 Full-time Female Faculty in the NSE as a Percentage of Total NSE Faculty by Discipline and Rank, 2010–2011

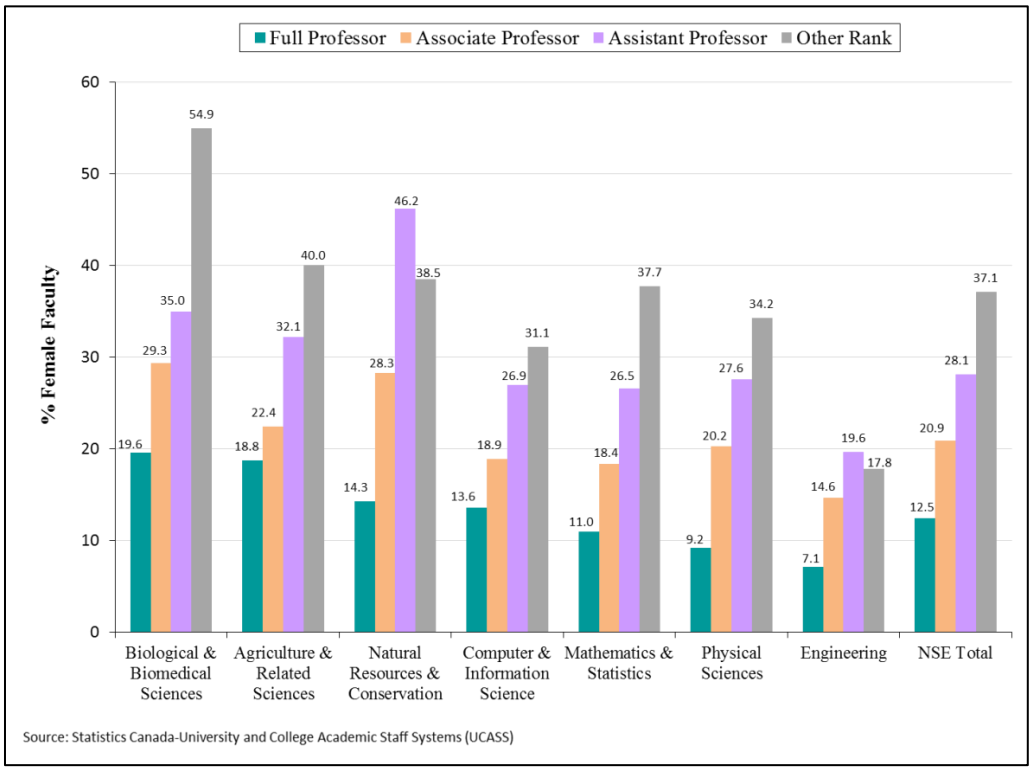
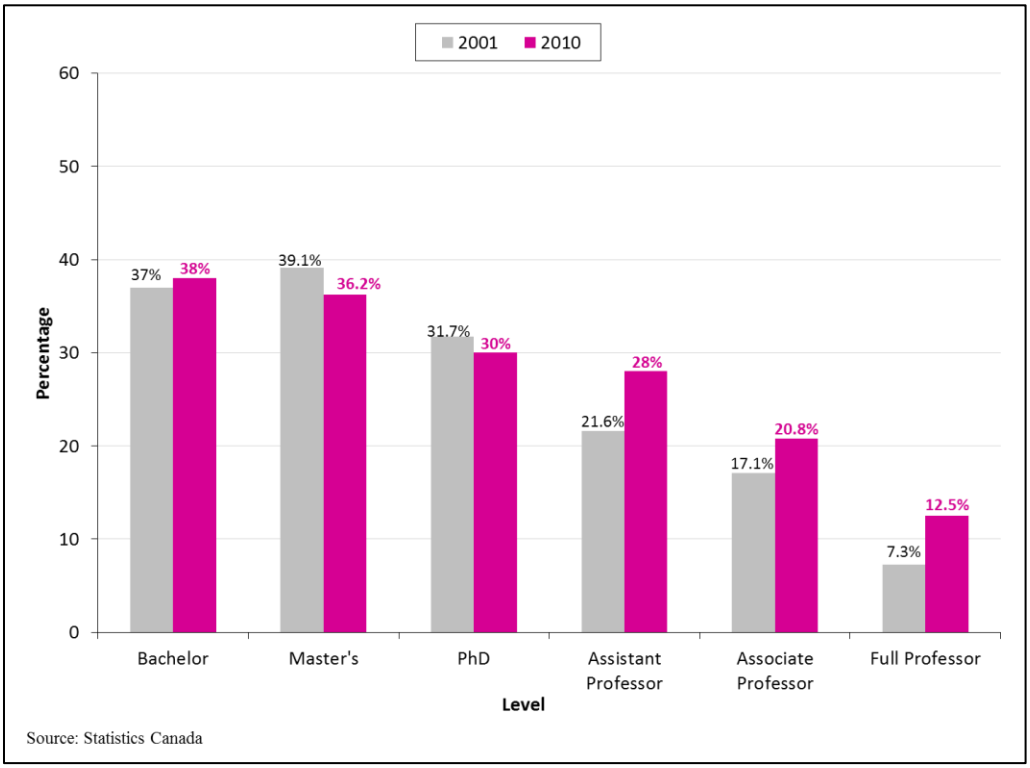


Figure 3.11 presents the percentage of women in the NSE at various stages of university education and academic careers in 2001–02 and 2010–11. Although there has been progress over the last decade, Figure 3.11 illustrates that gender equality among academic faculty is still very distant in the NSE.

Figure 3.11 Percentage of Women in the NSE at Various Levels of Education and Academic Careers, 2001–02 and 2010–11



Gender disparities, discrimination, lack of equity and bias in academia are well documented. A report by the Council of Canadian Academies entitled *Strengthening Canada's Research Capacity: The Gender Dimension* provides a comprehensive assessment of the factors that influence the university research careers of Canadian women.[21] The Expert Panel came to the conclusion that "There is no single solution to remedy the under-representation of women in the highest ranks of academic research careers. The issue itself is a multifaceted one that is affected by social, cultural, economic, institutional, and political factors and context."

[21] *Strengthening Canada's Research Capacity: The Gender Dimension*, Expert Panel on Women in University Research, Council of Canadian Academies, Ottawa, (ON), 2012.

Private Sector

After the academic sector, Canadian industries hire the largest number of research personnel and the second highest number of doctoral graduates to conduct research. Table 3.7 presents the number (both sexes) of professional personnel engaged in research and development (R&D) in industry by degree level. The most recent Statistics Canada estimates by sex were in 2003, and these showed female representation of 23.4 per cent at the bachelor's level, 25.9 per cent at the master's level and 21.1 per cent at the doctoral level. These numbers correspond to more recent data for European countries,[22] where women account for 39 per cent of researchers in the government sector, 37 per cent in higher education and barely 19 per cent in the business sector.

Table 3.7 Professional Personnel Engaged in R&D in Industry, by Degree Level, 2009–2013

Year	Bachelors	Masters	Doctorates	Total
2009	57,503	13,989	6,924	78,416
2010	56,522	17,014	8,126	81,662
2011	59,540	18,693	9,471	87,704
2012	56,335	17,110	9,662	83,107
2013	54,650	15,385	7,996	78,031

Source: Statistics Canada-Industrial Research & Development: Intentions-2015

In recent years, Statistics Canada has provided counts of research personnel in Canada by field of science or technology. Table 3.8 presents the number of R&D personnel by field/technology in 2013. The preponderance of R&D personnel in such areas as engineering, physical sciences, and mathematics and computer sciences, which typically have large male populations, probably lowers the probability of high female representation in private sector R&D positions.

[22] European Commission, *Meta-analysis of gender and science research*, Directorate-General for Research and Innovation Capacities Specific Programme, 2012, p. 125.

Table 3.8 Number of Business Enterprise Research and Development Personnel—By Field of Science or Technology, 2013

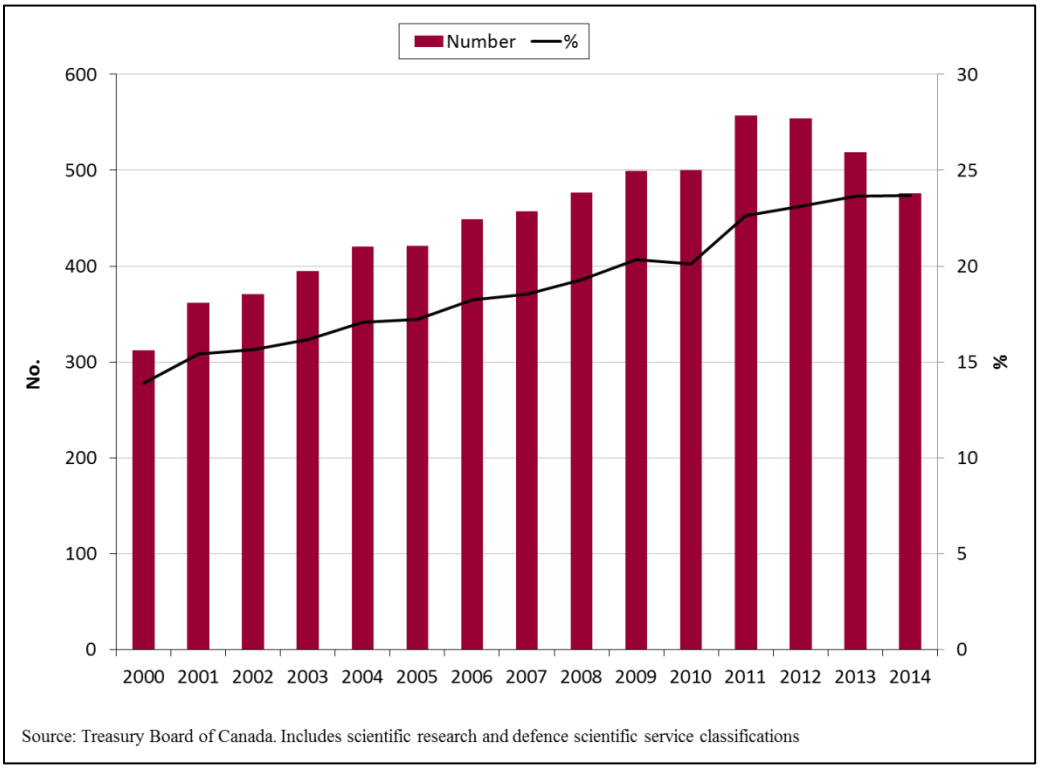
Field	2013
Physical Sciences	**4,958**
Physical Sciences	1,261
Chemical Sciences	2,466
Earth and Related Environmental Sciences	1,231
Mathematics and Computer Sciences	**8,041**
Mathematics and Computer Sciences	457
Computer and Information Sciences	7,584
Engineering	**103,536**
Civil Engineering	1,008
Software Engineering	29,011
Electrical and Electronic Engineering	27,459
Chemicals and Materials Engineering	8,624
Mechanical Engineering	17,864
Other Engineering	19,570
Life Sciences	**15,685**
Medical and Health Sciences	11,000
Biological Sciences	1,388
Agricultural Sciences	3,297
Total	**132,220**

Source: Statistics Canada 88-202-X

Government Sector

The government sector employs the fewest research personnel overall and the fewest research personnel with a PhD of the three sectors. The federal government is the largest employer of research scientists and engineers in the government sector, far outnumbering its provincial counterparts. There is a lack of data regarding degrees held by government researchers. However, there are data on the distribution by sex of federal government employees by job classification. The number of federal female research scientists and engineers is presented in Figure 3.12. As of 2014, women represented 23.7 per cent of federal research scientists and engineers, a significant improvement from their 13.9 per cent share in 2000.

Figure 3.12 Number of Female Research Scientists and Engineers in the Federal Government, 2000–2014



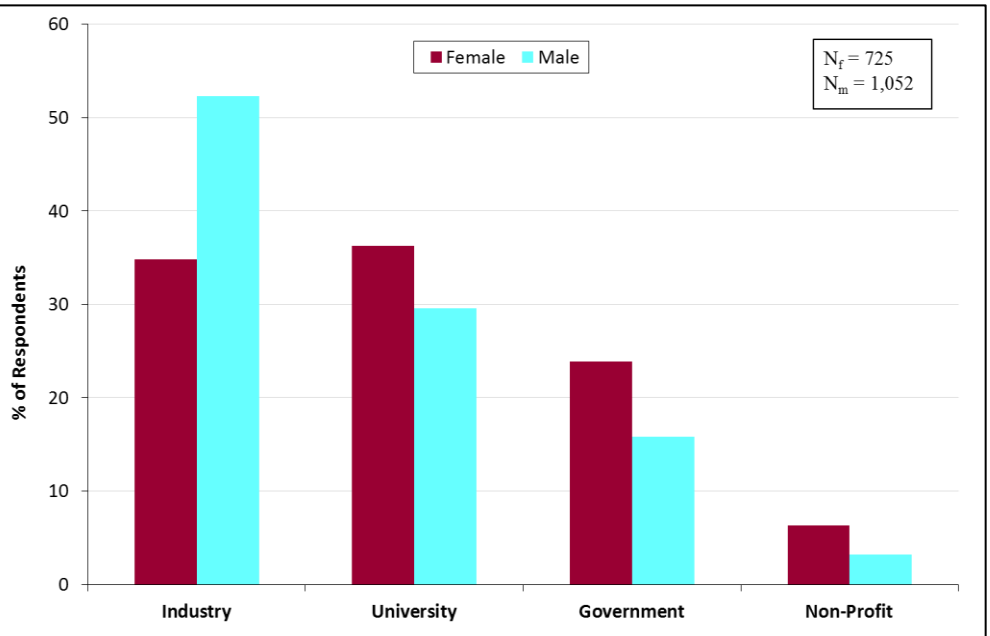
Source: Treasury Board of Canada. Includes scientific research and defence scientific service classifications

3.3 Career Outcomes of Former NSERC Scholarship and Fellowship Recipients

NSERC conducts surveys of former scholarship holders nine years after their award to collect some basic information on their current career. Figure 3.13 presents the sector of employment for the respondents to the surveys conducted from 1997 to 2013. Overall, a higher percentage of men work in the industrial sector. Figure 3.14 presents the activities on the job, with a higher percentage of men reported working on R&D and product development. As shown in Figure 3.15, both sexes felt equally appreciative of the training they received as it relates to their careers.

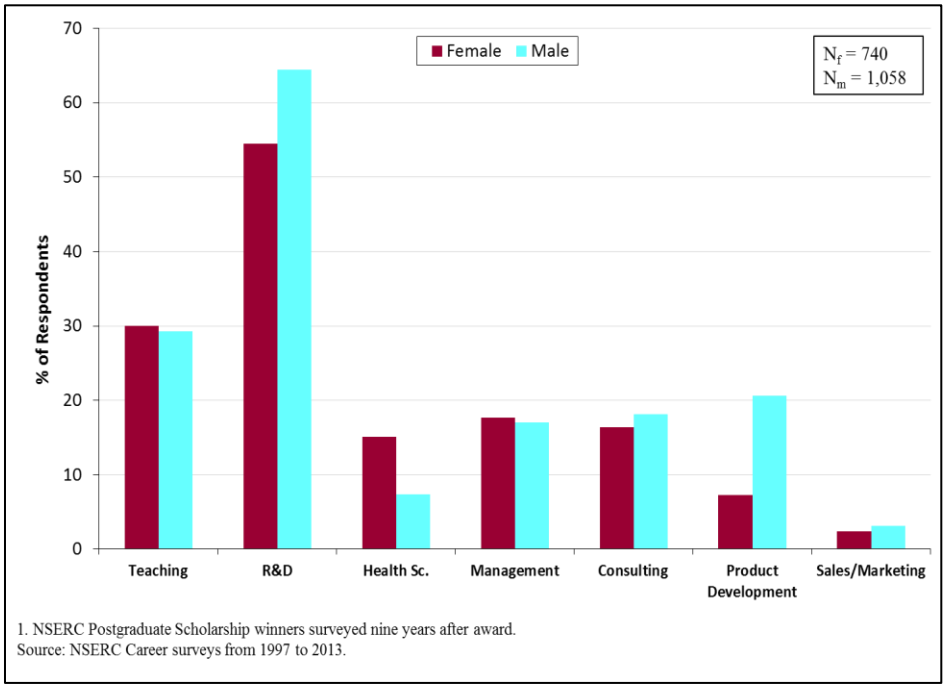
NSERC also surveys former postdoctoral fellowship holders seven years after their award. Survey data from 1999 to 2013 for the sector of employment, job activities and importance of training to their career are presented in Figures 3.16, 3.17 and 3.18. The results indicate that outcomes for males and females are more similar at the postdoctoral level than for postgraduates overall. Figure 3.19 indicates that former female and male NSERC postdoctoral fellowship holders are equally likely to recommend to a young person to follow in their career path.

Figure 3.13 NSERC Postgraduate Scholarship Career Outcomes[1] (Sector of Employment), 1997–2013



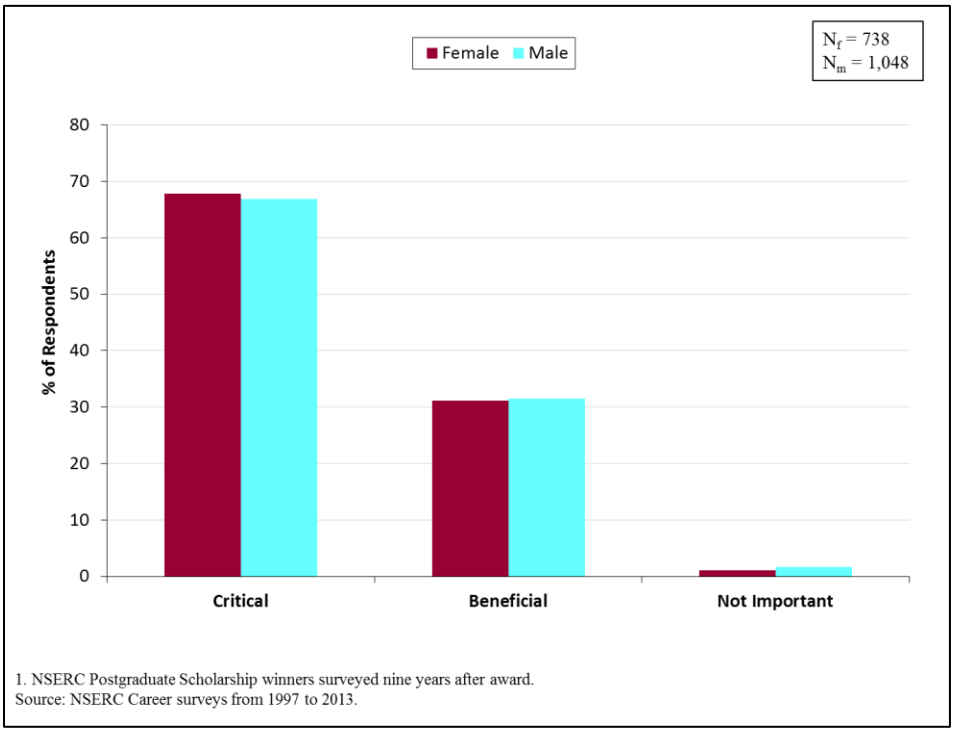
1. NSERC Postgraduate Scholarship winners surveyed nine years after award.
Source: NSERC Career surveys from 1997 to 2013.

Figure 3.14 NSERC Postgraduate Scholarship Career Outcomes[1] (Activities on the Job), 1997–2013



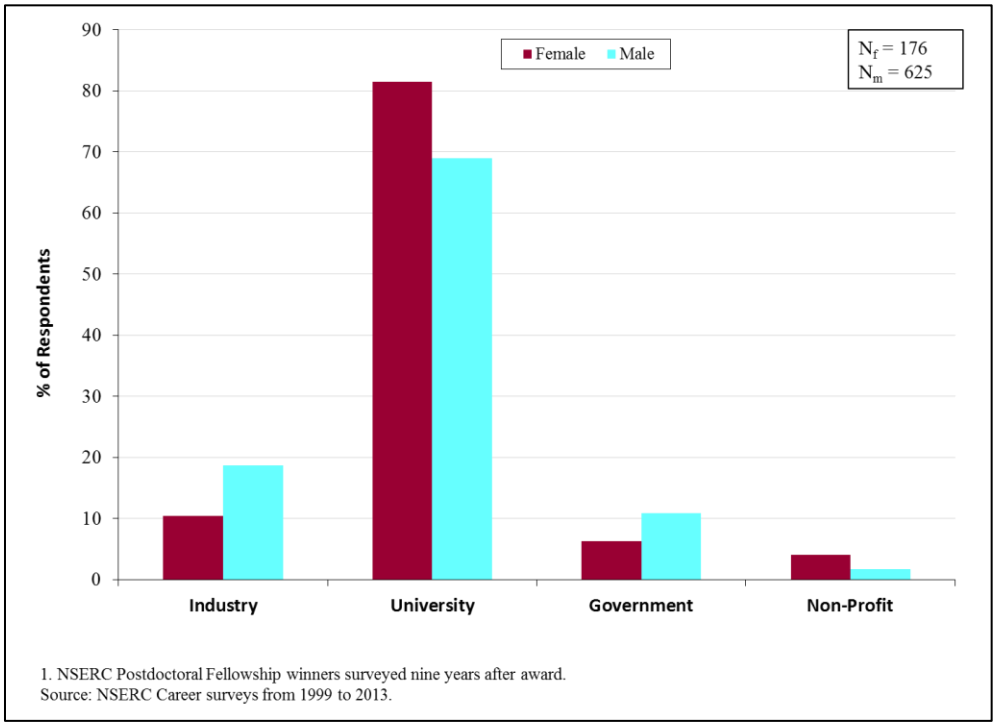
1. NSERC Postgraduate Scholarship winners surveyed nine years after award.
Source: NSERC Career surveys from 1997 to 2013.

Figure 3.15 NSERC Postgraduate Scholarship Career Outcomes[1] (Importance of Training to Career), 1997–2013



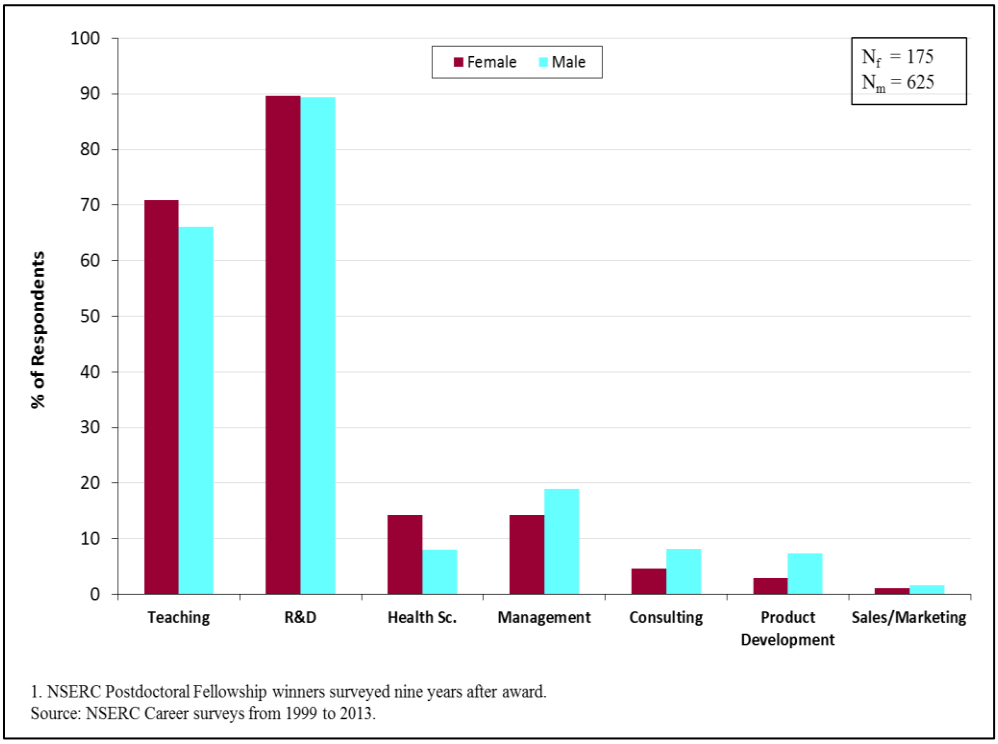
1. NSERC Postgraduate Scholarship winners surveyed nine years after award.
Source: NSERC Career surveys from 1997 to 2013.

Figure 3.16 NSERC Postdoctoral Fellowship Career Outcomes[1] (Sector of Employment), 1999–2013



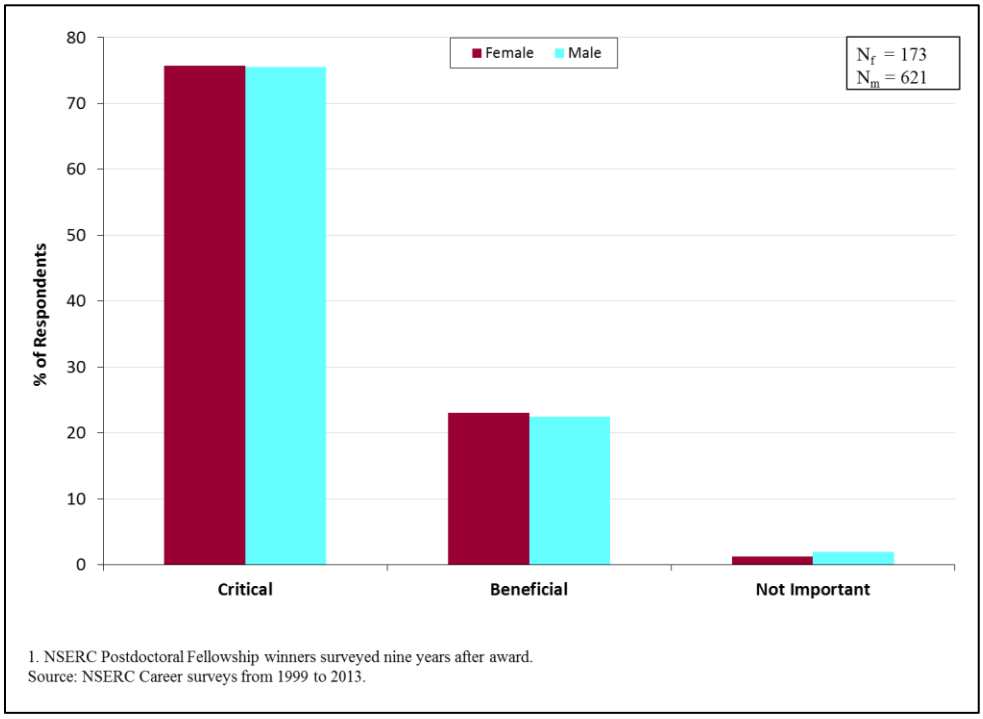
1. NSERC Postdoctoral Fellowship winners surveyed nine years after award.
Source: NSERC Career surveys from 1999 to 2013.

Figure 3.17 NSERC Postdoctoral Fellowship Career Outcomes[1] (Activities on the Job), 1999–2013



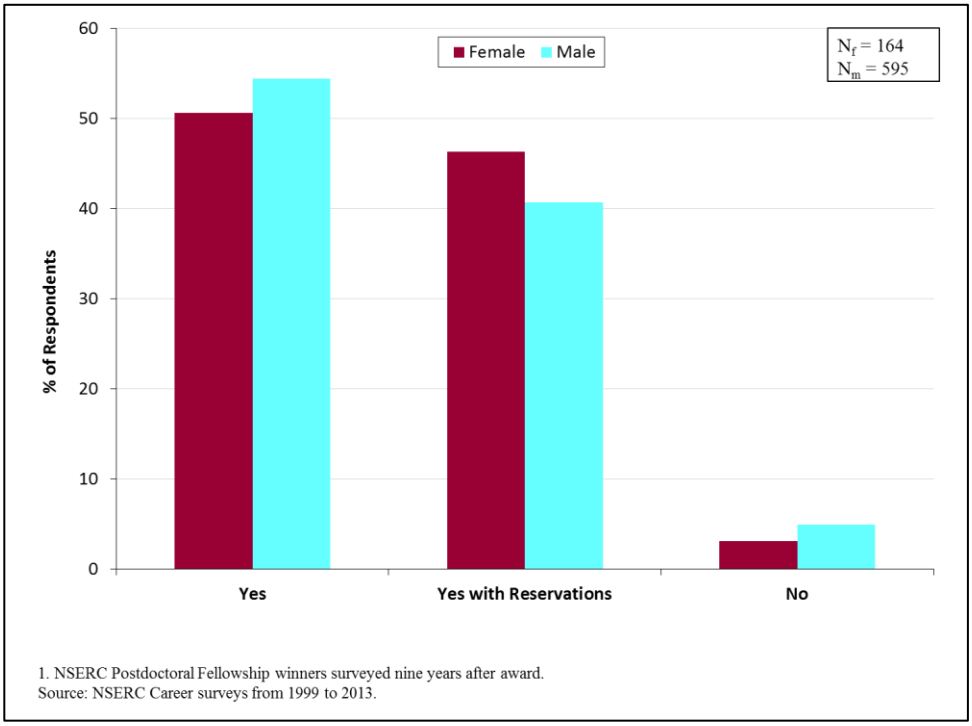
1. NSERC Postdoctoral Fellowship winners surveyed nine years after award.
Source: NSERC Career surveys from 1999 to 2013.

Figure 3.18 NSERC Postdoctoral Fellowship Career Outcomes[1] (Importance of Training to Career), 1999–2013



1. NSERC Postdoctoral Fellowship winners surveyed nine years after award.
Source: NSERC Career surveys from 1999 to 2013.

Figure 3.19 NSERC Postdoctoral Fellowship Career Outcomes[1] (Would Encourage a Young Person to Choose Same Career Path), 1999–2013



1. NSERC Postdoctoral Fellowship winners surveyed nine years after award.
Source: NSERC Career surveys from 1999 to 2013.

4. NSERC Statistics

NSERC is Canada's largest federal government funding agency that promotes and supports research in the natural sciences and engineering. The agency promotes discovery by funding research conducted by postsecondary professors and students, and fosters innovation by encouraging Canadian companies to participate and invest in postsecondary research and training.

In this section, data by sex collected by NSERC for several of its programs are presented on women's participation, success in receiving funding, student motivation to pursue education in the NSE, progression of women within NSERC programs, retention, mobility and nomination for and receipt of prestigious awards.

4.1 NSERC Program Statistics

As a major funder of the academic and student communities in the NSE, NSERC's statistics are another source of data for the analysis of trends in the Canadian academic research community.

The number of women receiving NSERC training awards and Discovery Grants (DGs) are presented in Table 4.1. NSERC's funding data by sex follows a pattern similar to the education and academic career data presented in Section 3. Female participation in NSERC's programs decreases from the undergraduate program to the DG program. The number of women awardees in the DG program has increased by 18.3 per cent over the past 10 years (2006–07 to 2015–16).

The rates of success for men and women participating in NSERC's programs with annual competitions are presented in Table 4.2. Generally, there are no significant differences in success rates by sex.

Figure 4.1 presents further details of the proportion of awards held by women for NSERC's major research programs in 2015–16. Female representation is lower in NSERC programs involving industry, which have a large concentration of engineering professors receiving grants. Figure 4.2 presents data for NSERC's major scholarship and fellowship programs, indicating a decline in female representation from the undergraduate to the postdoctoral level and for those programs involving industry.

Figure 4.3 compares NSERC funding with certain population benchmarks, such as student enrolments and faculty numbers in the NSE. The proportion of NSERC funding recipients exceeds the female population levels for student funding overall but is slightly below these levels for women at the postdoctoral and faculty levels.

Table 4.1 Number of NSERC Awards Held by Women, Various Programs

Fiscal Year	Undergraduate Awards (USRA)		Postgraduate Scholarships[2]		Postdoctoral Fellowships		Discovery Grants[3]	
	(No.)	(%)[1]	(No.)	(%)[1]	(No.)	(%)[1]	(No.)	(%)[1]
2006-07	1,805	44.0%	1,676	40.8%	131	27.9%	1,573	16.0%
2007-08	1,813	44.1%	1,831	40.7%	140	28.6%	1,697	16.8%
2008-09	2,210	42.5%	2,004	41.3%	144	29.9%	1,772	17.4%
2009-10	1,614	41.0%	2,045	40.9%	162	32.4%	1,756	17.5%
2010-11	1,586	40.7%	1,751	40.0%	162	31.2%	1,720	17.7%
2011-12	1,331	39.6%	1,500	39.1%	137	31.4%	1,785	18.7%
2012-13	1,154	40.4%	1,367	39.2%	101	30.0%	1,780	18.6%
2013-14	1,090	41.3%	1,298	38.6%	87	29.3%	1,766	18.8%
2014-15	1,146	41.2%	1,056	37.3%	110	33.1%	1,827	19.5%
2015-16	1,184	43.4%	1,154	38.9%	106	29.4%	1,861	19.9%

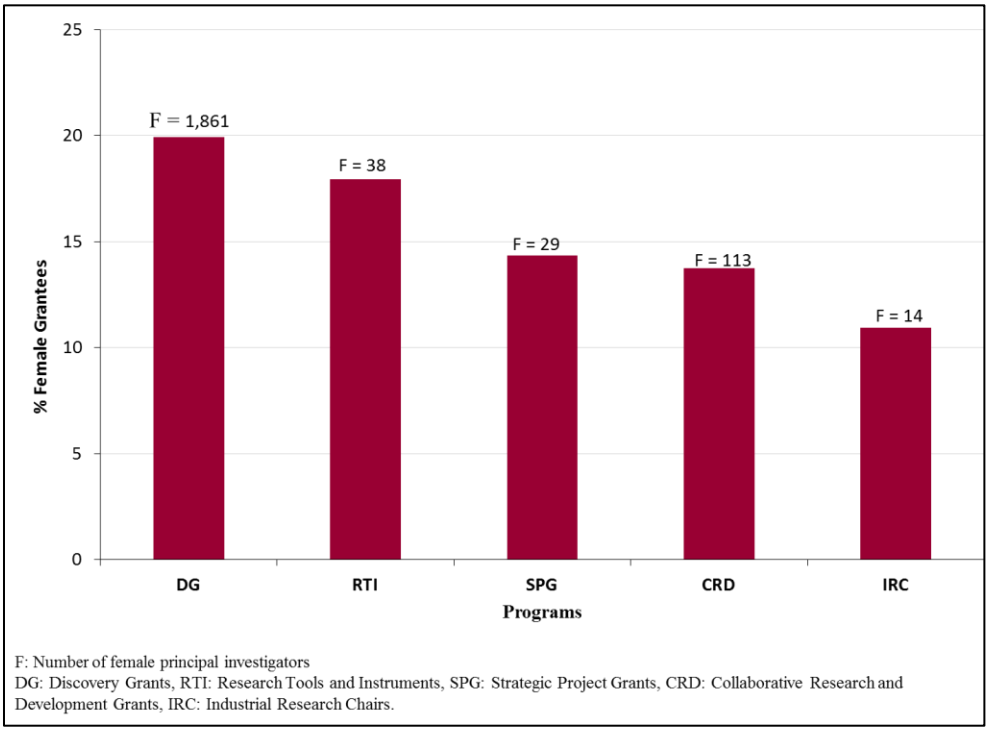
1. Percentage of awards to females, excludes unknown sex (typically less than 5%).
2. Includes Postgraduate Scholarships, Industrial Postgraduate Scholarships and Canada Graduate Scholarships.
3. Includes Individual and Individual Subatomic Physics Discovery Grants.

Table 4.2 Success Rates[1] by Sex, Various Programs

Competition Year	Postgraduate Scholarships[2]		Postdoctoral Fellowships		Discovery Grants[3]		Strategic Projects[4]	
	Females	Males	Females	Males	Females	Males	Females	Males
2007	68.3%	69.0%	22.2%	23.9%	70.9%	70.8%	48.1%	48.3%
2008	71.0%	69.3%	22.5%	21.0%	71.8%	71.6%	40.9%	39.1%
2009	72.3%	70.2%	19.2%	22.1%	59.7%	65.7%	25.9%	26.9%
2010	74.4%	69.8%	18.9%	22.2%	54.3%	59.3%	27.2%	21.9%
2011	51.6%	49.8%	8.0%	9.8%	58.8%	57.7%	15.9%	16.9%
2012	48.9%	45.3%	7.6%	8.3%	60.3%	62.9%	24.1%	25.5%
2013	57.6%	53.7%	12.8%	14.2%	56.3%	59.7%	19.0%	24.8%
2014	41.0%	43.7%	19.6%	21.0%	60.1%	65.1%	20.0%	27.6%
2015	61.8%	59.7%	30.9%	37.0%	64.0%	65.7%	26.7%	21.7%
2016	44.2%	45.3%	27.1%	32.9%	65.3%	66.9%	24.6%	24.4%

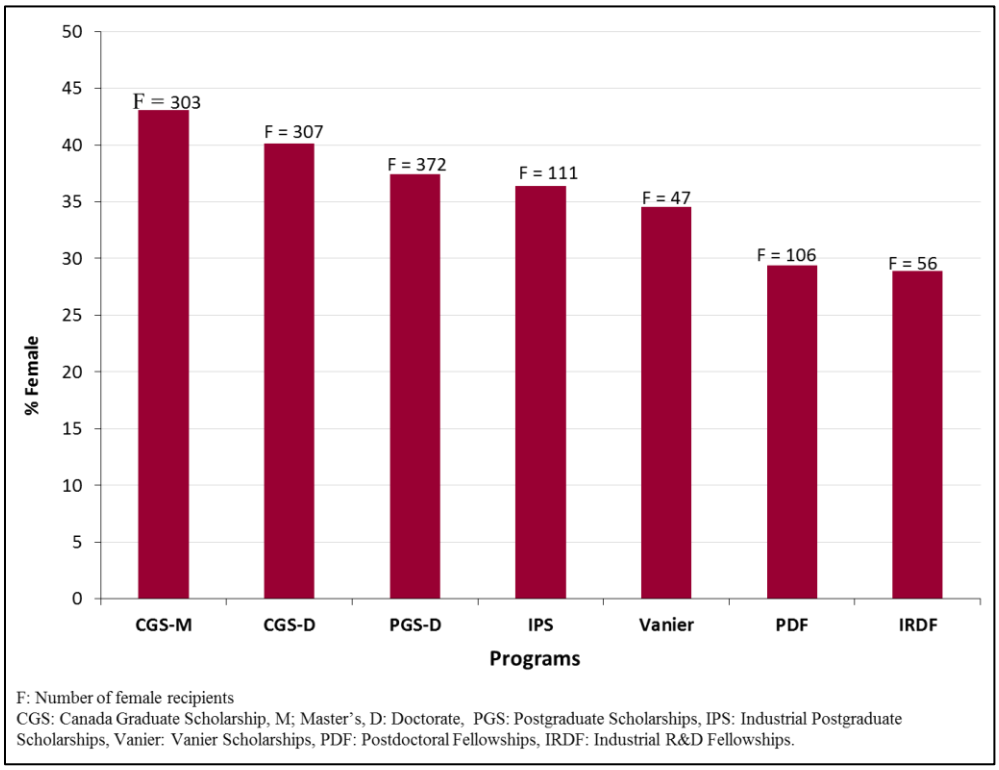
1. Number of awards divided by the number of applications
2. Includes Postgraduate Scholarships and Canada Graduate Scholarships.
3. Includes all applicants for Individual Discovery Grants;
Individual Subatomic Physics Discovery Grants were included since 2005.
4. Includes only principal investigators.

Figure 4.1 Number of Awards Held by Women for Selected NSERC Research Programs, 2015–16



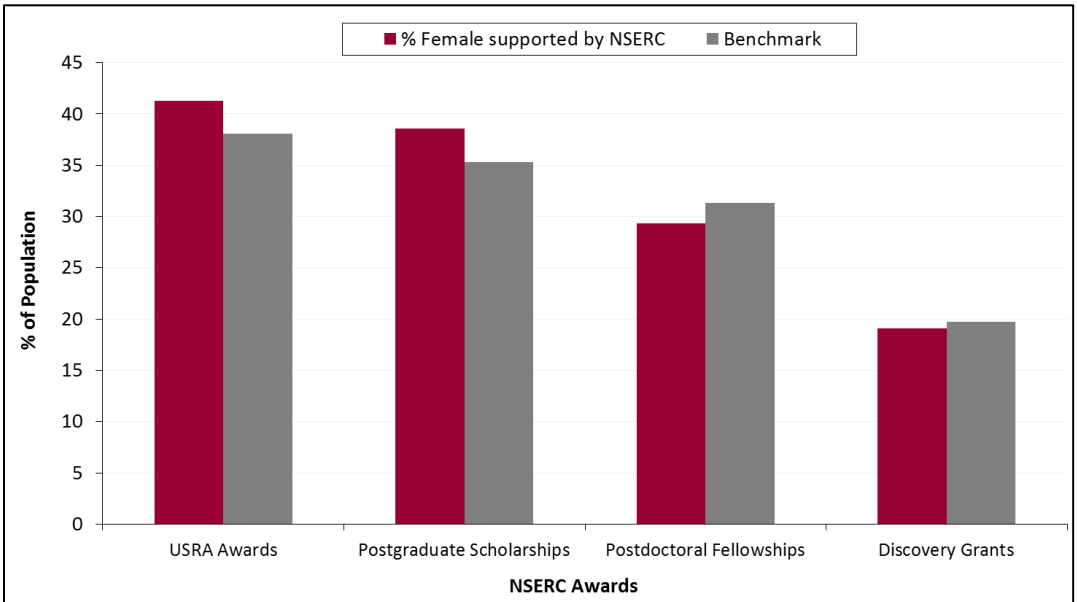
F: Number of female principal investigators
DG: Discovery Grants, RTI: Research Tools and Instruments, SPG: Strategic Project Grants, CRD: Collaborative Research and Development Grants, IRC: Industrial Research Chairs.

Figure 4.2 Number of Scholarships and Fellowships Held by Women for Selected NSERC Programs, 2015–16



F: Number of female recipients
CGS: Canada Graduate Scholarship, M; Master's, D: Doctorate, PGS: Postgraduate Scholarships, IPS: Industrial Postgraduate Scholarships, Vanier: Vanier Scholarships, PDF: Postdoctoral Fellowships, IRDF: Industrial R&D Fellowships.

Figure 4.3 NSERC Awards to Women vs. Benchmarks



Source: NSERC data and Statistics Canada. USRA benchmark is Canadian and permanent resident female undergraduate enrolment in the NSE in 2013-14. Postgraduate scholarships are for 2013-14 and benchmarks are Canadian and permanent resident female enrolments in the NSE at the master's and Ph.D levels for 2013-14. Postdoctoral fellowships are for 2013-14, and benchmark is doctoral degrees awarded to females in 2013-14. Discovery Grants is the percentage of awards to women in 2010-11, and the benchmark is the number of female faculty in the NSE in 2010-11.

4.2 Student Motivation to Pursue a University Education in the NSE

NSERC routinely conducts exit surveys of scholarship and fellowship award holders. A number of questions on the surveys are related to activities and/or people that contributed to the individuals' decision to pursue an education in the NSE. Tables 4.6 to 4.8 present women's and men's responses to a variety of statements for Undergraduate Student Research Award (USRA) holders, Postgraduate Scholarship (PGS) winners, and Postdoctoral Fellowship (PDF) recipients. The USRA and PGS exit surveys indicate that women tend to have more encouragement from family, teachers and professors to pursue an NSE education, and more exposure to R&D activities (science camps and R&D at the university). At the postdoctoral level there were no significant differences in the responses.

Table 4.3 Results from NSERC's Undergraduate Student Research Award (USRA) Exit Survey, 2005–2014

Statement	No. Respondents		No. Agree with Statement		% Agree with Statement		Statistical Difference
	Male	Female	Male	Female	Male	Female	Y/N
I am enjoying my undergraduate student life	11,276	9,110	8,491	7,169	75.3	78.7	**Y**
I participated in science camps and/or science fairs during my elementary and/or high school years	11,276	9,110	3,112	2,922	27.6	32.1	**Y**
So far, I have accumulated a high debt during my undergraduate education	11,276	9,110	2,385	1,916	21.2	21.0	N
My family encouraged me to pursue undergraduate studies in science/engineering	11,276	9,110	4,879	4,266	43.3	46.8	**Y**
A high school teacher encouraged me to pursue undergraduate studies in science/engineering	11,276	9,110	3,757	3,479	33.3	38.2	**Y**
Graduate studies will be an important element of my career goals	11,276	9,110	7,561	6,046	67.1	66.4	N
I would recommend my field of study to others	11,276	9,110	7,668	6,782	68.0	74.4	**Y**
My friends are pursuing graduate degrees	11,276	9,110	4,503	3,996	39.9	43.9	**Y**

Table 4.4 Results from NSERC's Postgraduate Scholarship Exit Surveys, 2005–2014

Statement	No. Respondents		No. Agree with Statement		% Agree with Statement		Statistical Difference
	Male	Female	Male	Female	Male	Female	Y/N
I enjoyed my undergraduate student life	6,814	5,554	5,005	4,229	73.5	76.1	**Y**
I was exposed to research during my undergraduate years	6,814	5,553	4,735	4,232	69.5	76.2	**Y**
I accumulated a high debt during my undergraduate degree	6,814	5,553	1,039	954	15.2	17.2	N
My friends are pursuing graduate degrees	6,813	5,553	2,029	1,882	29.8	33.9	**Y**
My family encouraged me to pursue graduate studies	6,813	5,553	2,595	2,442	38.1	44.0	**Y**
A professor encouraged me to pursue graduate studies	6,813	5,553	4,069	3,635	59.7	65.5	**Y**
Graduate studies are an important element of my career goals	6,813	5,553	5,179	4,202	76.0	75.7	N
I would recommend my field of study to others	6,813	5,553	4,197	3,589	61.6	64.6	**Y**
I would have gone on to or stayed in graduate school even without NSERC support	6,813	5,553	3,436	3,031	50.4	54.6	**Y**
I do not want to go into debt for graduate education	6,813	5,553	5,600	4,783	82.2	86.1	**Y**
It is difficult to find a job in my field without a graduate degree	6,813	5,553	2,750	2,835	40.4	51.1	**Y**

Table 4.5 Results from NSERC's Postdoctoral Fellowship Exit Surveys, 2005–2014

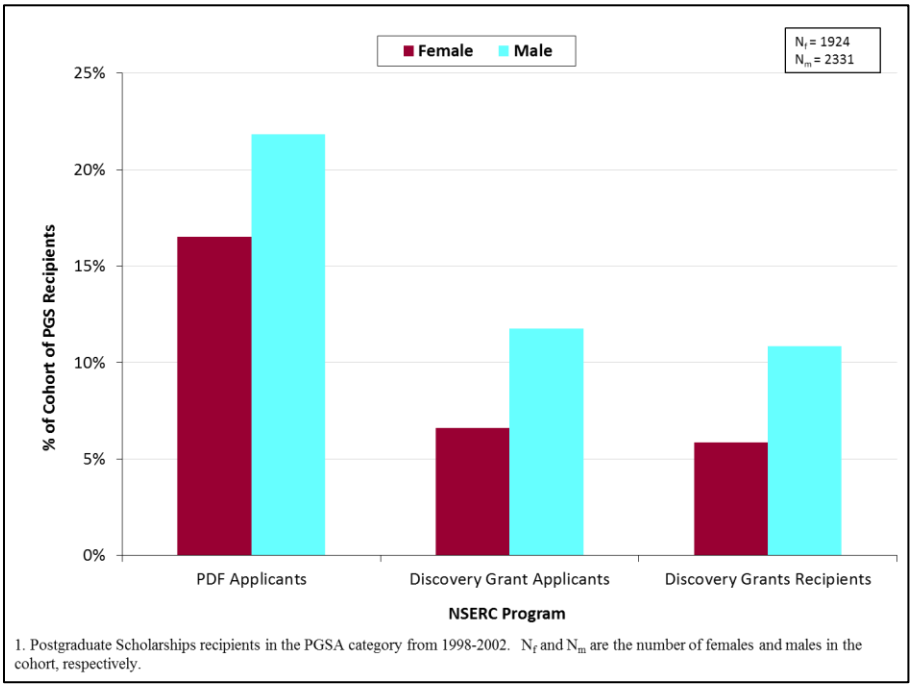
Statement	No. Respondents		No. Agree with Statement		% Agree with Statement		Statistical Difference
	Male	Female	Male	Female	Male	Female	Y/N
I enjoyed my undergraduate student life	743	324	502	217	67.6	67.0	N
I was exposed to research during my undergraduate years	743	324	461	231	62.0	71.3	N
I accumulated a high debt during my undergraduate and postgraduate education	743	324	145	60	19.5	18.5	N
My postgraduate experience prepared me well for postdoctoral work	743	324	597	268	80.3	82.7	N
A professor encouraged me to pursue a postdoctoral position	743	324	465	216	62.6	66.7	N
Postdoctoral work is an important element of my career goals	743	324	591	250	79.5	77.2	N
I would recommend my field of study to others	743	324	451	208	60.7	64.2	N
I would have taken a postdoctoral experience even without NSERC support	743	324	413	182	55.6	56.2	N
It is difficult to find a job in my field without postdoctoral experience	743	324	634	287	85.3	88.6	N
I find it is taking a long time to reach my career goals	743	324	436	169	58.7	52.2	N

4.3 Progression of Women Within NSERC Programs

The following section attempts to look at the progression of women within NSERC programs. Figure 4.4 presents the results for a cohort of NSERC scholarship winners from 1998 to 2002 and their subsequent applications for PDF and DGs. A larger percentage of men than of women from the cohort go on to apply for an NSERC PDF or DG, and also obtain a DG. This follows a similar pattern shown in Section 3 on enrolments, degrees and R&D careers.

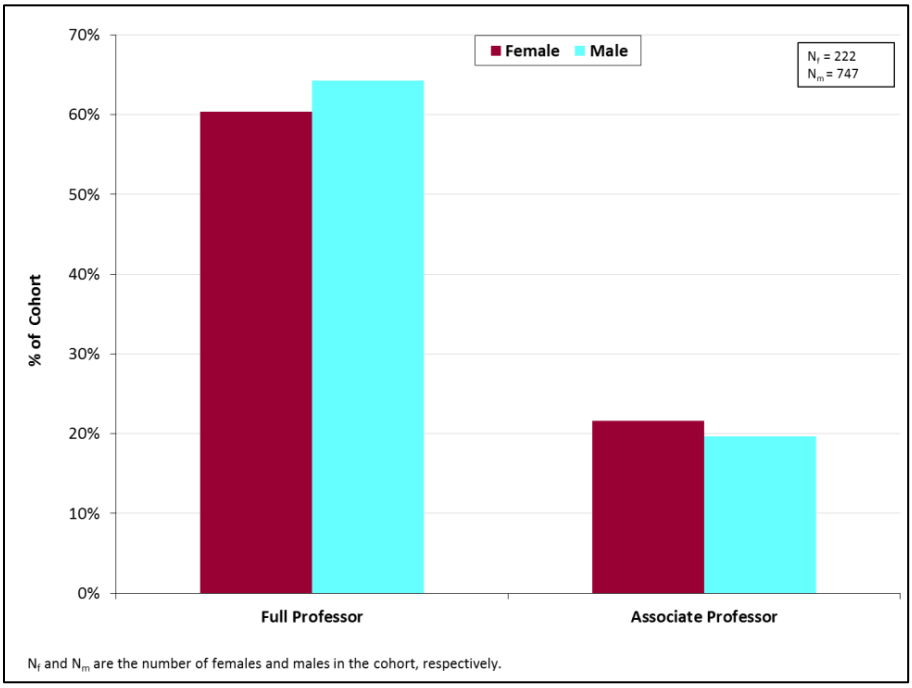
An examination of the rank that women and men currently hold after receiving their first DG in 1995 to 1999 was also undertaken. Figure 4.5 presents data for this indicator, which shows that men and women from this cohort have progressed at similar rates.

Figure 4.4 Progression of 1998–2002 Cohort of NSERC Postgraduate Scholarship Recipients[1]



1. Postgraduate Scholarships recipients in the PGSA category from 1998-2002. N_f and N_m are the number of females and males in the cohort, respectively.

Figure 4.5 Distribution of the 1995–1999 Cohort of New Grantees in Discovery Grants at Assistant Professor Level and Their Latest Position at Either Associate Professor or Full Professor

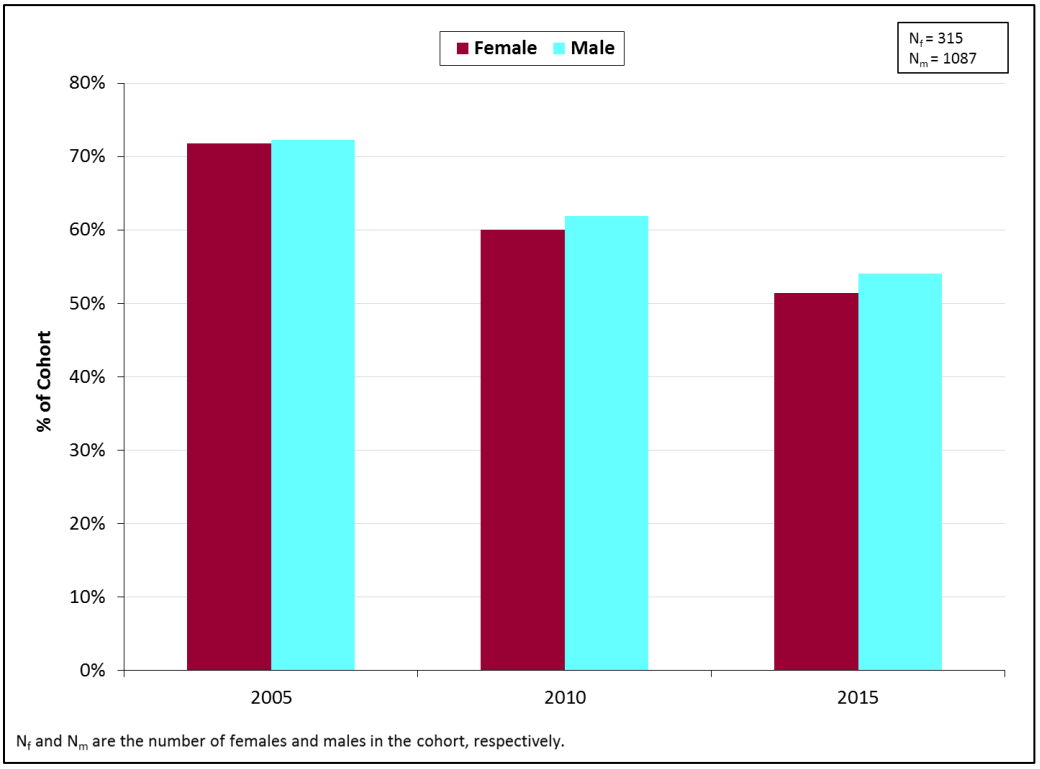


N_f and N_m are the number of females and males in the cohort, respectively.

4.4 Retention of First-Time Grantees

Figure 4.6 illustrates the grants held by a cohort of first-time grantees of NSERC's DG program from 1995 to 1999 and their subsequent awards in 2005, 2010 and 2015. A slightly smaller percentage of the female cohort versus the male cohort is still receiving a DG more than 15 years later.

Figure 4.6 Percentage of 1995–1999 Cohort of New Grantees in Discovery Grants Who Held a Discovery Grant in Subsequent Years



4.5 Scholarship and Fellowship Holders Going Abroad

Figures 4.7 and 4.8 present the number and percentage of scholarship and fellowship recipients who take their award abroad. At the doctoral level, there is no differences in the percentage of men and women going abroad, while at the postdoctoral level a small difference still exists.

Figure 4.7 Number and Percentage of NSERC Postgraduate Scholarships at the Doctoral Level Taken Abroad by Sex

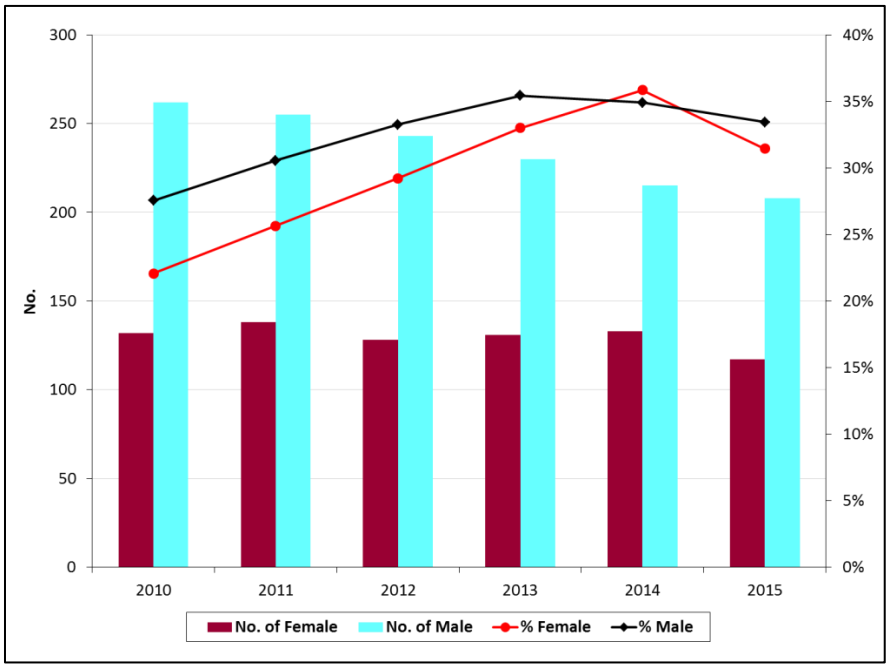
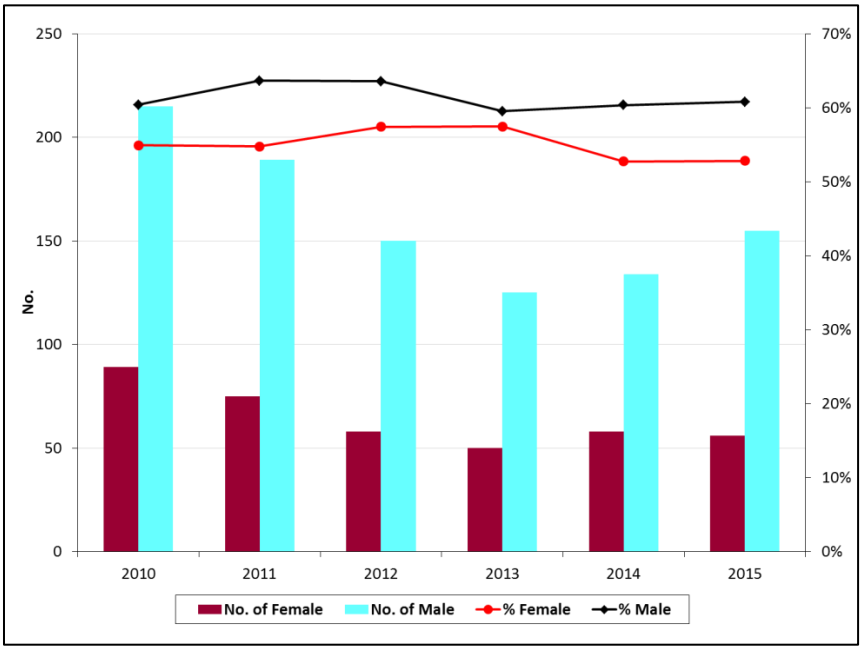


Figure 4.8 Number and Percentage of NSERC Postdoctoral Fellowships Taken Abroad by Sex



4.6 Prestigious NSERC Awards

Figure 4.9 presents the number of female and male winners of the E.W.R. Steacie Memorial Fellowships (Steacie Awards) for the past four decades. The number of women nominated for NSERC's Gerhard Herzberg Canada Gold Medal for Science and Engineering (see Figure 4.10) has not changed appreciably over the past 16 years and remains at very low levels. Three women scientists won prestigious NSERC prizes in 2016: Dr. Victoria Kaspi won the Herzberg Gold Medal, Dr. Barbara Sherwood Lollar won the John C. Polanyi Award, while Dr. Shana Kelley and her team received the Brockhouse Canada Prize for Interdisciplinary Research in Science and Engineering.

Figure 4.9 Number of NSERC Steacie Recipients – by Sex, 1978–2015

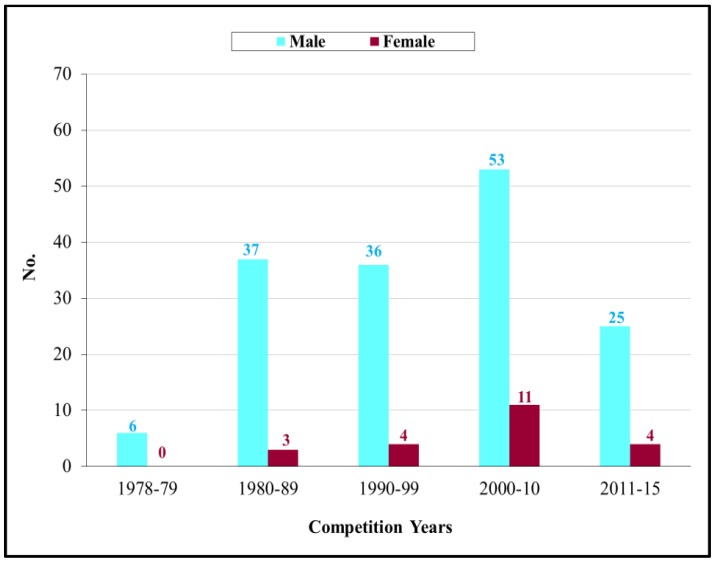
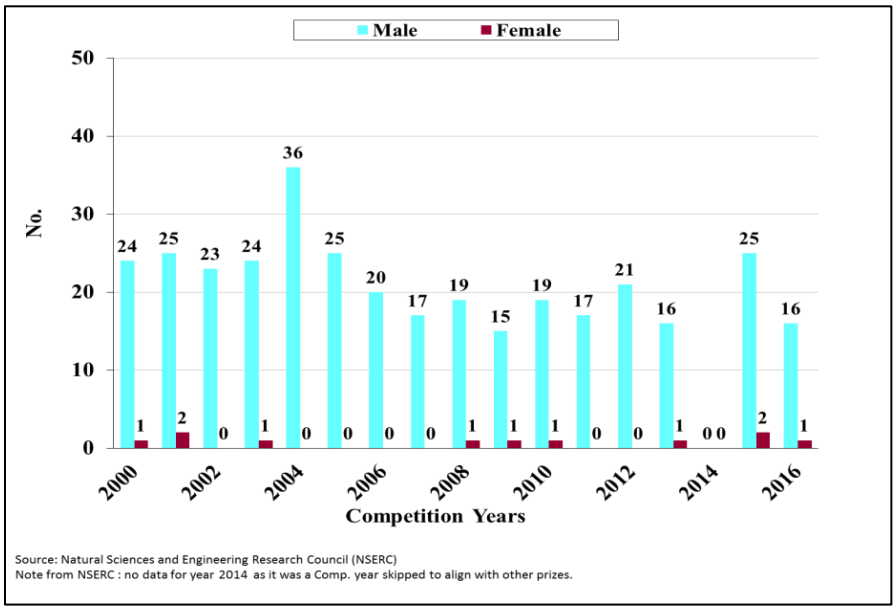


Figure 4.10 Number of Nominations for the NSERC Herzberg Gold Medal by Sex, 2000–2016



4.7 Committee Membership

Table 4.9 presents the membership of peer review committees by sex for NSERC's largest committees. Female representation is highest in the life sciences.

Table 4.6 NSERC Grant Selection Committee Membership by Sex, 2016

Committee	No. Females	No. Males	% Female
Discovery Grants			
Genes, Cells and Molecules	24	41	37%
Biological Systems and Functions	17	39	30%
Evolution and Ecology	6	17	26%
Chemistry	4	21	16%
Physics	6	29	17%
Geosciences	5	22	19%
Computer Science	9	34	21%
Mathematics and Statistics	11	20	35%
Civil, Industrial and Systems Engineering	5	27	16%
Electrical and Computer Engineering	6	26	19%
Materials and Chemical Engineering	5	19	21%
Mechanical Engineering	5	19	21%
Total	103	314	25%
Scholarships and Fellowships	35	61	36%
Strategic Project Panels	12	33	27%

5. Conclusion

Although enrolment by women in university education has increased in Canada over the last decade, the proportion of women students in the various STEM fields has not seen substantial change.

Our data indicate that, although the number of female and male students who could enrol in undergraduate science and engineering programs is similar, the sharpest drop in girl's and women's STEM studies occurs right after high school. While there are numerous outreach programs, encouraging girls to follow their interests and pursue STEM fields further after high school is still a hurdle.

According to Dr. Tamara Franz-Odendaal, the Atlantic regional Chair for NSERC's program for Women in Science and Engineering, early engagement (before high school) is a key factor in guiding girls into science careers. In surveying students in grades 7 through 9, Dr. Franz-Odendaal and her team found that girls who engaged in activities such as science fairs, competitions and engineering summer camps were 2.7 times more likely to consider a STEM career.[23]

As a federal funding agency, NSERC plays a role in increasing the inclusion of women in the NSE in Canada. Increasing investments in programs such as PromoScience, CREATE and Chairs for Women in Science and Engineering and policy changes will extend our reach and help attract more girls and women to the NSE.

[23] *Career Choices and Influencers in Science, Technology, Engineering and Math: An Analysis of the Maritime Provinces,* WISEatlantic Survey–Executive Report, Halifax (NS), January 2014, available at http://www.wiseatlantic.ca/pdf/WISEatlantic%20Executive%20Report%20-%20January%202014.pdf.