



The Conference Board
of Canada

Le Conference Board
du Canada

Inside and Outside the Academy.

Valuing and Preparing PhDs for Careers



REPORT NOVEMBER 2015

Inside and Outside the Academy: Valuing and Preparing PhDs for Careers

Jessica Edge and Daniel Munro

Preface

A PhD is a prerequisite for an academic career, but fewer than 20 per cent of Canada's PhDs are employed as full-time university professors. The majority of PhDs are employed in a wide range of rewarding careers outside academia.

This report examines the employment opportunities and outcomes of PhD holders. It characterizes the challenges some PhD graduates face when transitioning to careers beyond academia, as well as the state of demand for PhDs among Canada's employers. The valuable contributions PhDs make in a wide range of careers are highlighted. The report examines the status of professional skills development for PhD students and presents innovative examples of professional development initiatives in Canada and peer countries.

To cite this report: Edge, Jessica, and Daniel Munro. *Inside and Outside the Academy: Valuing and Preparing PhDs for Careers*. Ottawa: The Conference Board of Canada, 2015.

©2015 The Conference Board of Canada*

Published in Canada | All rights reserved | Agreement No. 40063028 | *Incorporated as AERIC Inc.

An accessible version of this document for the visually impaired is available upon request.

Accessibility Officer, The Conference Board of Canada

Tel.: 613-526-3280 or 1-866-711-2262 E-mail: accessibility@conferenceboard.ca

®The Conference Board of Canada and the torch logo are registered trademarks of The Conference Board, Inc. Forecasts and research often involve numerous assumptions and data sources, and are subject to inherent risks and uncertainties. This information is not intended as specific investment, accounting, legal, or tax advice. The findings and conclusions of this report do not necessarily reflect the views of the external reviewers, advisors, or investors. Any errors or omissions in fact or interpretation remain the sole responsibility of The Conference Board of Canada.

CONTENTS

i EXECUTIVE SUMMARY

Chapter 1

- 1 Introduction**
- 3 Professional Skills for PhDs
- 4 Employer Demand and Receptor Capacity
- 5 Purpose of the Report
- 6 Methodology
- 7 Structure of the Report

Chapter 2

- 8 From Classes to Careers: Pathways and Outcomes for PhDs**
- 9 PhDs in Canada: Profile and Trends
- 12 Field of Study
- 15 Career Expectations of PhD Graduates in Canada
- 20 Delayed Retirements Are Not a Major Issue
- 23 Employment Outcomes for PhDs in Canada
- 27 Earnings
- 32 Weak Employer Demand and Challenging Transitions
- 37 Valuing and Preparing PhDs

Chapter 3

- 39 Inside and Outside the Academy: The Value of a PhD in Canada**
- 41 Individual Benefits and Costs of Pursuing a PhD
- 42 Knowledge and Skills Gained Through PhD Studies
- 49 Social Contributions of PhDs Beyond PSE
- 52 Arts and Cultural Contributions of PhDs Beyond the Academy
- 53 Conclusion

Chapter 4

- 54 What's Needed?**
- 55 Professional Development Challenges
- 57 Barriers to Successful Transitions
- 61 Easing Career Transitions for PhD Graduates
- 66 Conclusion

Chapter 5

- 67 The State of Professional Skills Development Initiatives in Canada**
- 68 Supplementary Skills Development Initiatives
- 73 Immersive Initiatives
- 78 Transformative Initiatives
- 82 Conclusion

	Chapter 6
84	Learning From International Models
86	Industrial PhD Programs
86	Denmark's Industrial PhD Programme
91	Skills Development Initiatives
97	Lessons Learned From International Initiatives
	Chapter 7
99	Recommendations
106	Conclusion
	Appendix A
108	Bibliography

Acknowledgements

This report was prepared by The Conference Board of Canada, under the direction of Dr. Michael Bloom, Vice-President, Industry and Business Strategy. The report was researched and written by Dr. Jessica Edge and Dr. Daniel Munro.

The authors thank Dr. Carl Amrhein, Michael Bloom, Diana MacKay, and Doug Watt for their advice and guidance. The report was reviewed internally by Dr. Matthew McKean, Senior Research Associate, Industry and Business Strategy. Thanks also go to external reviewers Prof. Reinhart Reithmeier, Professor of Biochemistry and Special Advisor to the Dean of Graduate Studies on Graduate Professional and Leadership Development, University of Toronto; and Dr. Jennifer Polk, Academic, Career, and Life Coach, and Founder of From PhD to Life.

The report was prepared with financial support from the Centre for Skills and Post-Secondary Education.

The findings and conclusions of this report are entirely those of The Conference Board of Canada. Any errors and omissions in fact or interpretation remain the sole responsibility of The Conference Board of Canada.

About the Centre for Skills and Post-Secondary Education

The Conference Board of Canada's Centre for Skills and Post-Secondary Education is a major, multi-year initiative that examines the advanced skills and education challenges facing Canada today. While education is a provincial government responsibility, improving the skills and post-secondary education system is a national priority. The Centre involves a broad collaboration of public and private sector stakeholders working together to think through the development of a national strategy. The Centre addresses Canada's advanced skills needs by helping to renew the roles, structure, activities, and impact of post-secondary education, while ensuring Canada's skills development and sustainability, competitiveness, and quality.

For more information about the Centre for Skills and Post-Secondary Education, visit www.conferenceboard.ca/spse.

EXECUTIVE SUMMARY

Inside and Outside the Academy: Valuing and Preparing PhDs for Careers

At a Glance

- Fewer than one in five PhD graduates are employed as full-time university professors. The majority of PhDs are employed outside academia in a wide range of rewarding careers—such as in industry, government, and not-for-profit organizations.
- Many PhD graduates face challenging initial transitions to careers outside academia due to underdeveloped professional skills and networks, difficulty articulating the value of the skills gained through PhD studies to non-academic employers, and limited employer awareness or misperceptions about the potential value of PhD hires.
- Canadian universities have implemented a wide range of graduate professional skills development initiatives to ease career transitions for PhDs. The most effective approaches combine general skills development workshops, and classes or online resources with some personalized feedback or coaching. PhD students can also benefit from experiential learning opportunities.

Most PhDs employed in non-academic positions advance to rewarding careers, but many face challenging initial transitions out of academia.

Each year, thousands of PhD students begin PhD studies across Canada with the goal of becoming a tenured university professor. However, the reality is that less than one in five PhD graduates ultimately become university professors. The majority of PhD graduates enter a wide range of rewarding careers in industry, government, and not-for-profit organizations. It is beneficial for Canada's economy and society that so many PhDs are employed in non-academic positions. The knowledge, skills, and dispositions of PhDs—including their deep understanding of specific fields; advanced research, analysis, and communication skills; and creative, detail-oriented, and persistent personalities—make them well-suited to advancing innovation both inside and outside academia. Indeed, PhDs are well-situated to fuel productivity and economic competitiveness, improve organizational performance, address health and social issues, and make valuable contributions to arts and culture.

Most PhDs employed in non-academic positions advance to rewarding careers, but many face challenging initial transitions out of academia. The reasons include limited awareness of non-academic career paths, weak employer demand, and difficulty translating the skills they gained into language that appeals to employers. Limited demand from Canadian employers, who may not be fully aware of the value a PhD can bring to their organization, can further hinder graduates' career transitions.

Purpose of the Report

This report examines the employment opportunities and outcomes of PhD holders both inside and outside academia. It characterizes the challenges that some PhD graduates face when transitioning to careers beyond PSE, as well as the state of demand and receptor capacity for PhDs among Canada's employers. The valuable contributions that PhDs make in a wide range of careers are highlighted. The report examines the state of professional skills development for PhD students and innovative examples of professional development initiatives in Canada and peer countries.

Career Pathways and Outcomes for PhDs

Canada has experienced significant growth in the proportion of the population with a PhD. Between 2002 and 2011, the number of PhDs granted by Canadian universities increased by 68 per cent, while the number of students enrolled in PhD programs increased by almost 73 per cent. Canada recruits thousands more PhDs through immigration each year: PhDs held in Canada are almost evenly split between immigrants (50.4 per cent) and non-immigrants (49.6 per cent).

Only 18.6 per cent of employed PhDs in Canada become full-time professors. However, approximately 40 per cent are employed in careers in the post-secondary (PSE) sector—such as part-time university professors, research and teaching assistants, administrators, PSE support staff, and postdoctoral scholars. Yet, in all fields of study, PhDs are more likely to be employed in a non-academic sector than as full-time university professors.

In general, PhDs fare well in the Canadian labour market, and most PhDs are satisfied with their careers. PhDs have a lower unemployment rate and higher labour force participation rate than master's and bachelor's degree holders. PhDs also see higher earnings than others, although the length of time it takes to complete a PhD and the resulting

forgone earnings mean that economic returns on the PhD are modest. Furthermore, explicit employer demand for PhD graduates is generally weak and, in many cases, starting salaries for PhDs are low.

Easing Career Transitions for PhD Graduates

Most PhD graduates ultimately go on to rewarding, well-paying careers. But the orientation of PhD programs toward academic employment—and the challenges associated with pursuing a non-academic career—make transitions to careers outside PSE difficult for some PhD graduates. Many PhD graduates have limited awareness of non-academic careers, and may have difficulty articulating the value of the skills for non-academic careers, which they gained through their PhD studies. Some new PhD graduates may find that they lack some of the skills and experience required by employers (e.g., management experience), which can circumscribe their career opportunities and limit them to jobs at a level similar to master's degree graduates.

The challenges faced by PhDs transitioning to non-academic jobs can be exacerbated by the negative perceptions of PhDs held by some employers. Employers with little or no experience hiring PhDs may view them as too highly specialized, or may not be aware that the skills and tasks emphasized through PhD research have direct applicability to the workplace. In some cases, employers may see value in the completion of a PhD degree, but may not value the PhD recipient as highly as the five to seven years' work experience that an individual may have gained instead of completing a PhD program.

To ease career transitions, PhD students require information about the realities of the current job market and common career paths outside academia. Collecting and sharing information about career paths could also help employers understand the value that PhDs can bring to a wide range of careers. Many PhD students need assistance developing the skills and professional networks needed to transition out of academia. While many PhD students have strong networks of contacts inside academia, they often lack networks of professional contacts outside

Universities across Canada and in peer countries have implemented a wide range of graduate professional skills development initiatives to ease career transitions for PhDs.

PSE, and may struggle to build such networks. Students can benefit from connecting with former PhD alumni in non-academic careers. PhD students may need help translating the skills that they have gained in their PhD studies into language that appeals to non-academic employers. Students need information on creating resumés and cover letters that showcase their advanced skills for a non-academic audience. They also need assistance preparing for interviews, and negotiating job offers.

Universities across Canada and in peer countries have implemented a wide range of graduate professional skills development initiatives to ease career transitions for PhDs. Professional skills development initiatives can be classified into three broad categories:

1. **Supplementary initiatives:** Voluntary workshops, seminars, online resources, etc. that are offered in addition to PhD programs.
2. **Immersive initiatives:** Voluntary programs that allow students to undertake immersive, experiential learning opportunities, such as internships, to develop and apply skills in a non-academic environment.
3. **Transformative initiatives:** Initiatives or proposals to restructure PhD programs to include integrated professional development training.

The most effective approaches combine general skills development workshops, classes, or online resources with some personalized feedback or coaching. PhD students can also benefit greatly from access to experiential learning opportunities, such as internships. These have the added benefit of allowing employers to see the valuable contributions PhDs can make to their organization, thereby combating employer misperceptions about PhDs.

Strategies for Action

PhD graduates must be able to transition smoothly into a wide range of rewarding careers that utilize the skills developed during their studies. The aim of PhD programs must continue to be to train world-class

INSIDE AND OUTSIDE THE ACADEMY
Valuing and Preparing PhDs for Careers

researchers—but researchers with the skills to thrive inside and outside academia. The report outlines the following eight strategies to strengthen career outcomes for PhD graduates:

1. Collect and distribute information about the full range of PhD career pathways.
2. Conduct additional research on PhD career pathways.
3. Consider career outcomes before increasing enrolment in PhD programs or introducing new programs.
4. Create comprehensive professional development initiatives for students.
5. Develop PhD alumni networks.
6. Increase opportunities for experiential learning.
7. Promote the value of PhDs to employers.
8. Facilitate the sharing of professional development resources and best practices across institutions.

CHAPTER 1

Introduction

Chapter Summary

- Canada graduates, and attracts through immigration, thousands of new PhDs every year—some of whom go on to careers as university professors.
- Sixty per cent of PhDs in Canada take on roles outside post-secondary education (PSE)—in industry, government, and non-governmental organizations (NGOs)—and make valuable contributions to Canada’s economic, social, political, cultural, and artistic well-being.
- Although most go on to rewarding and well-paying careers, many PhD graduates initially face challenging transitions to non-academic careers due to underdeveloped professional skills and networks, and limited employer awareness or misperceptions about the potential value of PhD hires.
- To achieve maximum benefit from the knowledge and skills of PhDs, changes are needed to ensure that all PhD graduates have the skills to find good jobs and build successful careers. Employers must recognize the value of a PhD education, and effectively employ PhDs, to take full advantage of their knowledge and skills.

A PhD is the modern prerequisite for an academic career, but fewer than 20 per cent of Canada's PhDs are employed as full-time university professors. (In total, about 40 per cent are employed in post-secondary education).¹ Instead, the majority find jobs and careers outside PSE—in industry, government, and non-governmental organizations. It is beneficial to Canada's economy and society that so many PhDs take positions in non-academic settings. PhDs are highly educated researchers with subject matter expertise as well as advanced analytical and problem-solving skills. They are well-situated to fuel innovation and economic competitiveness, improve organizational performance, address health and social issues, and make valuable contributions to arts and culture.

While highly skilled, many PhDs initially struggle to transition to careers outside of PSE. This is due to limited awareness of non-academic career paths and difficulty articulating, to non-academic employers, the full value of the skills they gained during their studies. Limited demand from Canadian employers, who may not be fully aware of what PhDs can offer their organization, further hampers graduates' transition to non-academic careers.

This report explores the value of employing PhDs in organizations and activities both inside and outside the academy. It examines the state of professional skills development for PhD students, and Canadian

¹ Statistics Canada, 2011 National Household Survey: Catalogue no. 99-012-X2011035 and custom tables. In Canada, 208,480 individuals (aged 15 or above) hold earned doctorates, but only 159,685 are in the labour force and 153,335 are employed. The unemployment rate for PhDs in Canada in 2011 was approximately 4 per cent.

Today, most Canadian universities offer professional skills development courses, workshops, and other resources to supplement PhD education.

and international initiatives that aim to support students' professional development. Finally, the report identifies strategies to enhance career outcomes for PhDs.

Professional Skills for PhDs

Sixty per cent of PhD students in all disciplines begin their studies aiming to become university professors.² However, the number of PhDs held and granted in Canada far exceeds available academic positions. As such, there is a gap between many PhD students' initial career aspirations and career realities.

Universities, faculty, students, and others have increasingly recognized the need to better prepare PhD students to pursue careers outside the academy. In 2007, representatives of graduate studies associations from Canada, Australia, China, Europe, and the United States agreed to guiding principles on graduate education. This included emphasizing the need to develop global career competencies in students and engaging diverse stakeholders—including employers—in graduate education improvement.³ In Canada, the issues are being discussed with increasing frequency. For example, a recent report called for changes to PhD programs in the humanities, including “reforming doctoral training so that it leads to a multiplicity of career paths instead of only one.”⁴

Canadian universities are part of the dialogue and many are taking action to address career-related issues. Today, most Canadian universities offer professional skills development courses, workshops, and other resources to supplement PhD education. For example, seven Ontario universities, with support from the Ontario Ministry of Training, Colleges and Universities, recently launched MyGradSkills.ca—an initiative that offers 18 online professional skills development modules for graduate students. The program emerged from the recognition that

2 Maldonado, Wiggers, and Arnold, *So You Want to Earn a PhD?* 16.

3 Council of Graduate Schools, *Banff Principles on Graduate Education*.

4 Institute for the Public Life of Arts and Ideas, *White Paper on the Future of the PhD*, 1.

“most graduate students now follow career paths other than that of a tenure-track professor at research universities” and, as such, “need to learn about those other career paths, and how to apply the skills and knowledge from their graduate programs to a wide range of careers.”⁵ In addition, a number of private services for PhDs transitioning to non-academic careers have also emerged—such as private career coaching marketed directly to PhD graduates, and the website, the Versatile PhD, which offers career guidance for graduate students.

Many of the skills development initiatives—offered by universities for PhDs—are relatively new. Many focus on graduate students as a whole, as opposed to the specific needs of PhD students. Moreover, exactly what students need is not always clear. Is it that students and graduates lack certain professional skills? Do they have skills, but have difficulty identifying and articulating them in resumés, interviews, and other interactions with employers? Do they have challenges applying self-reflection and assessment to their future career and life goals? To ease the transition from academic to non-academic settings for Canada’s PhD graduates, Canadian institutions need to continue to expand and enhance appropriate professional skills development opportunities.

Employer Demand and Receptor Capacity

The skills of PhDs are not the only factors affecting their career prospects outside the academy. Many employers in Canada do not recognize the full value of employing PhDs in a range of occupations; many also harbour misperceptions about the skills and dispositions of those who have spent years studying and working in academic environments.

Research from a number of countries shows, however, that firms with an existing receptor capacity and a clear understanding of the performance value that PhDs offer—such as established research and development

5 Sekuler, “Welcome to MyGradSkills.ca.”

PhDs employed in research positions outside the academy tend to be found in only a few sectors and firms.

(R&D) departments, or those with PhDs already on staff—not only make transitions for PhDs easier, but also experience more significant and direct benefits as a result of employing PhDs.⁶

In Canada, key elements of receptor capacity are weak. For example, in the Conference Board’s How Canada Performs Innovation Report Card, Canada earns a grade of “D” and ranks 15th out of 16 peer countries on business spending on R&D.⁷ Moreover, business R&D spending is concentrated in a relatively small number of firms.⁸ As a result, PhDs employed in research positions outside the academy tend to be found in only a few sectors and firms (such as the pharmaceutical industry), or in public sector research and policy institutions (where, arguably, the receptor capacity for PhDs is better). Therefore, when considering how to expand and enhance professional skills development initiatives for PhD students, we should consider policies or programs that could stimulate demand and improve the receptor capacity for PhDs in non-academic sectors of the economy.

Purpose of the Report

This report examines and analyzes the state of PhD students’ professional skills and the opportunities to develop these skills. It identifies strategies to help expand and improve skills development initiatives. Additionally, the report examines the state of demand and receptor capacity for PhDs among Canada’s employers and suggests steps that could be taken to improve both.

6 Cruz-Castro and Sanz-Menéndez, “The Employment of PhDs in Firms”; Stephan, *Wrapping It Up in a Person*, 71–98.

7 The Conference Board of Canada, *How Canada Performs: Business Enterprise R&D Spending*.

8 Munro, *Running on Empty*; Research Infosource Inc., *Canada’s Top 100 Corporate R&D Spenders 2014*.

In particular, the report:

- highlights the importance of PhD education to Canada's economic, social, and cultural well-being outside the PSE system;
- examines the employment opportunities and outcomes of PhD holders both inside and outside the academy, and the kinds of training and preparation they should receive;
- characterizes the challenges PhD students and graduates face as they transition to careers beyond PSE;
- analyzes professional skills formation initiatives for PhD students in Canada, in order to identify best practices and lessons learned;
- analyzes a subset of international PhD programs and skills development initiatives, in order to identify options and lessons for Canadian PhD programs;
- examines the state of demand and receptor capacity for PhDs among Canada's employers and suggests steps that could be taken to improve both;
- presents recommendations to institutions, governments, employers, students, and other stakeholders about actions to ease transitions for PhD graduates into careers outside PSE.

Methodology

The research methodology involved both quantitative and qualitative analyses, including:

- a review of books, articles, reports, and other documents that address the opportunities and challenges facing recent PhD graduates in Canada and abroad, and the skills development initiatives being implemented to address skills needs;
- collection and analysis of data from a variety of sources to provide a quantitative picture of PhDs in Canada—including total PhDs and trends in enrolment and graduation, fields of specialization, and labour market outcomes (e.g., sector of employment, earnings);

- over 20 interviews with experts and coordinators of graduate professional skills initiatives to better understand what is being offered; who is participating; challenges faced; outcomes for students, institutions, and employers; and opportunities for improvement and expansion;
- consultations with a variety of stakeholders (e.g., students, program heads, deans, recent graduates, and career services professionals) to gain additional perspectives on research questions and initial findings, and to receive feedback on preliminary report drafts.

Structure of the Report

Chapter 2 offers a profile of the PhD population in Canada and examines trends in enrolments and graduations. After discussing the gap between PhD students' and graduates' career expectations and realities, the report examines employment outcomes for PhDs, the challenges many face in transitioning to careers outside PSE, and implications for the training of future PhD students and graduates.

Chapter 3 highlights the economic, social, and cultural contributions of PhD graduates outside PSE, with particular emphasis on their role in sustaining and enhancing Canada's innovation and productivity performance. Chapter 4 identifies and articulates what could help ease PhD graduates' transition to the workplace and enhance their success in diverse careers. Chapter 5 examines various professional skills formation initiatives for PhD students in Canada and assesses their effectiveness. Chapter 6 examines a subset of international PhD programs and skills development initiatives in order to identify options and lessons for Canadian PhD programs.

Finally, Chapter 7 sets out principles of effective initiatives and recommends actions and investments that educators, governments, students, employers, and other stakeholders can make to improve professional skills formation opportunities for PhD students, thereby benefiting individuals, the economy, and society.

CHAPTER 2

From Classes to Careers: Pathways and Outcomes for PhDs

Chapter Summary

- Canada has experienced substantial growth in the total number of PhDs held in the population, as well as in enrolments and degrees granted annually.
- More than 60 per cent of PhD students commence their studies aspiring to become tenured university professors (depending on the field of study). Yet, fewer than 20 per cent will ultimately hold such positions.
- Most PhDs are employed in diverse, well-paying careers outside PSE. However, many face challenging transitions to full employment due to weak employer demand, challenges articulating their skills and the value of the PhD to employers, and differences between academic and non-academic work and workplace cultures.

Canadian universities award PhDs to thousands of individuals who have mastered knowledge of a field and developed advanced skills to make further discoveries and communicate findings. Thousands more PhDs are recruited through immigration every year.¹ While the number of PhDs in Canada has increased dramatically in recent years, fewer than 20 per cent are employed as full-time university professors, and fewer still are in tenured or tenure-track positions.² With only a minority of PhD graduates finding employment as full-time, tenure-track university professors, PhD education must ensure it is preparing graduates for satisfying and rewarding careers both inside and outside PSE.

This chapter offers a profile of the PhD population in Canada and examines trends in enrolments and graduations. It examines the career expectations and realities of those with PhDs and discusses the challenges many face as they transition to careers outside PSE.

PhDs in Canada: Profile and Trends

Canada has experienced significant growth in the total number of people with PhDs in the population, and in new enrolments and graduations annually. In 2011, Canada was home to 208,480 individuals with PhDs. Among those aged 25 to 64, 161,805 held PhDs—or just under 1 per cent of the population aged 25 to 64.³ This was 14 per cent higher than

¹ Statistics Canada, CANSIM table 477-0020.

² Non-tenure-track university professor positions include full-time contract professors, and other non-tenure-track professor positions.

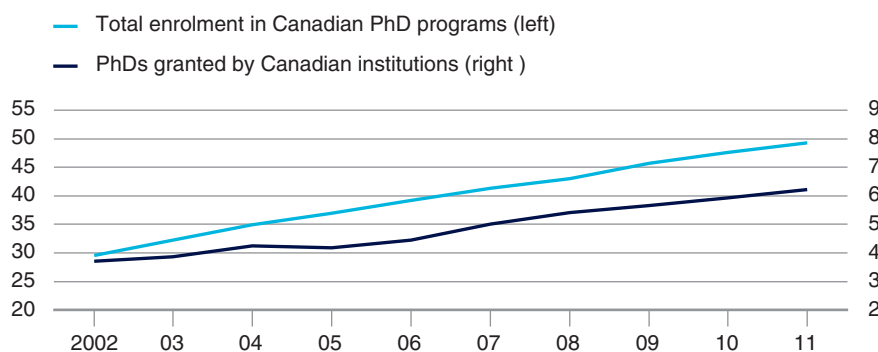
³ Statistics Canada, *2011 National Household Survey*.

the 142,180 individuals who held PhDs in 2006, and 48 per cent higher than the 109,420 who held PhDs in 2001.⁴ PhD holders in Canada earned them either at Canadian institutions (58 per cent) or abroad (42 per cent).⁵

The annual rate of increase has also grown considerably. In 2002, Canadian universities granted 3,723 new PhD degrees. In 2011, they granted 6,219—a 68 per cent increase in annual production over the decade.⁶ During the same period, the number of students enrolled in PhD programs at Canadian institutions grew from 27,576 in 2001–02 to 47,628 in 2010–11: an increase of nearly 73 per cent.⁷ (See Chart 1.)

Chart 1

PhD Program Enrolments and Degrees Granted in Canada, 2002–11
(number, 000s)



Sources: Statistics Canada, CANSIM 477-0019 and CANSIM 477-0020.

Graduate students and postdoctoral fellows carry out an important part of the research in universities and affiliated institutions. They make novel discoveries and provide new insights that advance knowledge—a key

4 Statistics Canada, *Census of Population, 2001 and 2006*.

5 Ibid.

6 Statistics Canada, CANSIM 477-0019.

7 Statistics Canada, CANSIM 477-0020.

Canada had a PhD graduation rate of 88 per 100,000 population aged 25 to 39.

mission of universities. In the sciences, research programs rely heavily on graduate students who work on their supervisors' projects, often as members of research teams. The high, international ranking of research-intensive universities owes much to the efforts of graduate students.

However, Canada graduates proportionally *fewer* PhDs each year than all but one peer country examined in the Conference Board's *How Canada Performs: Education Report Card*. In 2011, Canada had a PhD graduation rate of 88 per 100,000 population aged 25 to 39. Many countries—including Switzerland (215), Finland (193), Germany (188) and the U.S. (119), had much higher rates.⁸ If having a high proportion of people with PhDs improves economic and social well-being—a hypothesis explored below—then Canada's lagging rate may be cause for concern and suggests a need to continue to expand programs or increase the numbers of PhD immigrants, or both.

Age of PhDs in Canada

Despite the recent upswing in the number of PhD enrolments and degrees granted, the proportion of the population holding a PhD is similar throughout most age cohorts. In each of three age cohorts (35 to 44, 45 to 54 and 55 to 64), between 0.9 and 1 per cent of the population hold a PhD. Among those aged 25 to 34 the rate is somewhat lower (0.6 per cent), but this is due to the fact that most PhDs are not earned until after the age of 30. Looking at just the five-year subcohort, aged 30 to 34, the proportion holding a PhD is 0.9 per cent—consistent with the rate of other age cohorts. The 45 to 54 cohort contains more people and more PhD holders. But, as shown below, it is not enough of an outlier to create serious concerns about Canada's ability to replace those in academic positions as they age and eventually retire.

8 The Conference Board of Canada, *How Canada Performs: PhD Graduates*.

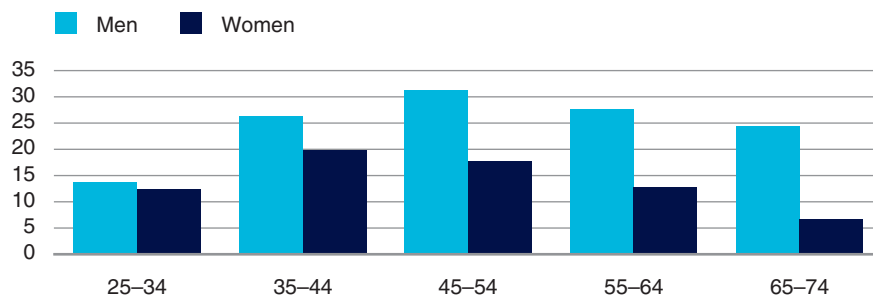
Gender of PhDs in Canada

More PhDs are held by men than women in Canada, though recent trends are quickly closing the gap. While 61 per cent of PhD holders aged 25 to 64 are men,⁹ among those aged 25 to 34 (i.e., those who earned their PhDs more recently), men hold only 53 per cent while women hold 47 per cent of PhDs.¹⁰ The trend to female participation continues: in the 2011–12 academic year, women comprise 50.7 per cent of Canadian PhD program enrollees. When international students studying at Canadian institutions are included, however, male students (52.6 per cent) outnumber female students (47.4 per cent) in the total PhD student population.¹¹

Chart 2

PhDs in Canada, by Age and Sex, 2011

(number, 000s)



Source: Statistics Canada, National Household Survey, 2011.

Field of Study

There have been noticeable changes in fields of study among PhD graduates over the years. Although precise historical comparisons are difficult to make, we can get a sense of changes over time by

9 Statistics Canada, 2011 *National Household Survey*, Catalogue no. 99-012-X2011042.

10 Ibid.

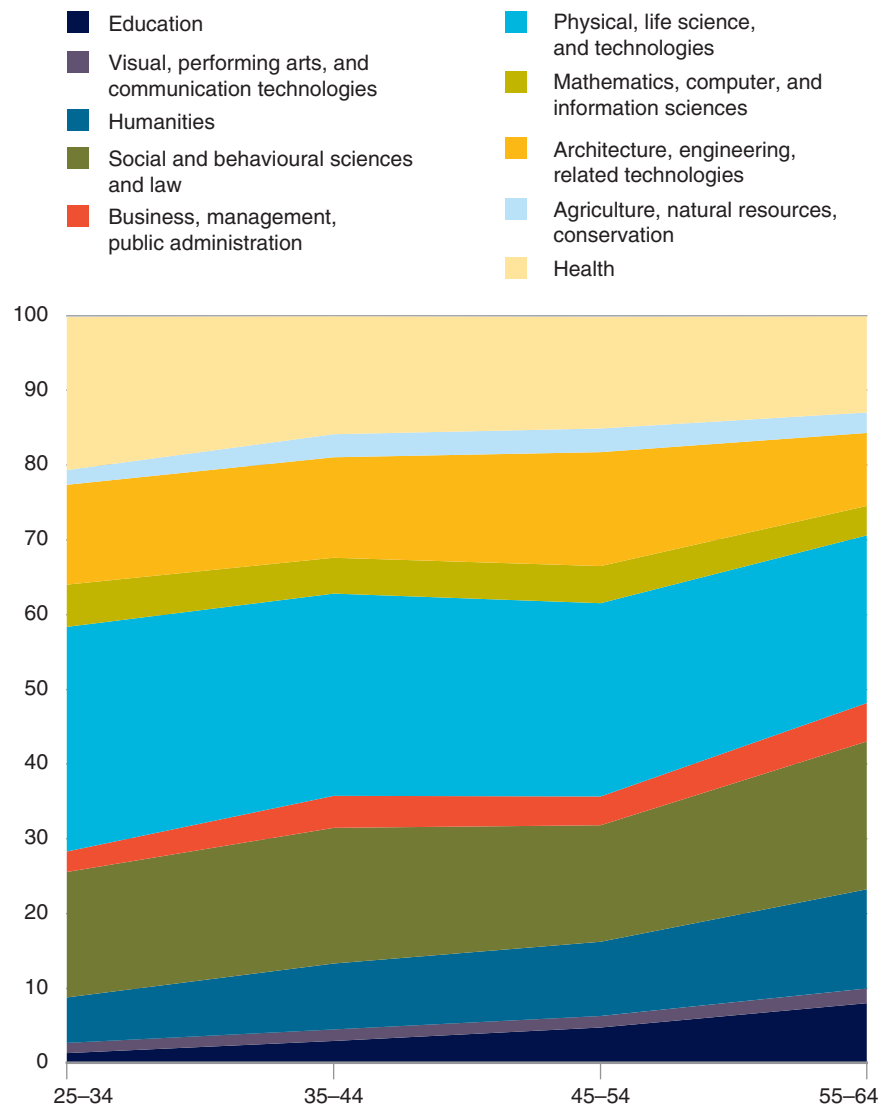
11 Statistics Canada, CANSIM 477-0019.

looking at fields of specialization for different age cohorts. While some individuals in older age cohorts will have earned their PhDs recently, making this approach an imperfect indicator, it provides some important clues. (See Chart 3).

Chart 3

PhDs by Field of Study and Age Cohort in Canada, 2011

(per cent)



Source: Statistics Canada, National Household Survey, 2011.

The most obvious differences between age cohorts appear in the fields of education, humanities, health, physical sciences, and architecture/engineering.¹²

- In the 55 to 64 age cohort, 8 per cent of all PhDs are held in *education*. This falls to less than 3 per cent of PhDs in the 35 to 44 age cohort and 1 per cent in the 25 to 34 cohort. Not only does the proportion fall, but the absolute number of education PhDs in the 35 to 44 cohort (1,360) is less than half of those held in the 55 to 64 cohort (3,235).
- There are also fewer *humanities* PhDs (absolutely and proportionally) in younger age cohorts. Humanities PhDs are held by 5,345 individuals aged 55 to 64—about 13 per cent of all PhDs in the cohort. Among those aged 35 to 44, there are 4,070 humanities PhDs (less than 9 per cent in the cohort); of those aged 25 to 34, less than 7 per cent hold PhDs in the humanities.
- An opposing trend occurs in *health*-related disciplines where, among those aged 55 to 64, there are 5,165 PhDs accounting for almost 13 per cent in the cohort. Of those aged 35 to 44, however, there are 7,290 PhDs accounting for 15.8 per cent. In the 25 to 34 cohort, the 5,370 health-related PhDs constitute over one-fifth of all PhDs in the cohort.
- Substantial growth has also occurred in *physical and life sciences and related technologies*. In the 55 to 64 cohort, there are 9,070 PhDs (22.5 per cent). Among those aged 35 to 44, there are 12,500 PhDs (27.1 per cent) and, in the 25 to 34 cohort, 7,880 PhDs account for over 30 per cent of all PhDs held in that cohort.
- Finally, individuals in younger cohorts are more likely to have a PhD in architecture, engineering, and related technologies than those in older cohorts. Fewer than 10 per cent of those aged 55 to 64 hold a PhD in these fields versus 13.5 per cent among those aged 35 to 44, and 13.3 per cent among those aged 25 to 34.

12 All data below are Conference Board calculations based on Statistics Canada, 2011 *National Household Survey*, Catalogue no. 99-012-X2011037.

Conventionally, PhD programs are often viewed as apprenticeships in academia for academic careers.

Location of Study and Immigration Status

PhDs held in Canada were earned from institutions in Canada and abroad, by immigrants and non-immigrants. The intersection of location of study and immigration status has numerous implications for understanding labour market outcomes and the transition difficulties faced by different groups of PhDs.¹³

- PhDs held in Canada are almost evenly split between immigrants (50.4 per cent) and non-immigrants (49.6 per cent).
- Nearly three-fifths (58 per cent) of PhDs held in Canada by those aged 25 to 64 were earned at Canadian institutions. Two-thirds of these are held by non-immigrants; and one-third were earned by immigrants who studied at institutions in Canada and subsequently stayed in the country.
- More than two-fifths (42 per cent) of PhDs held in Canada by those aged 25 to 64 were earned from institutions outside Canada. More than 75 per cent were earned by immigrants prior to arriving in Canada, while a quarter were earned by Canadians who studied abroad.
- The 46,225 immigrants who earned their PhDs abroad were most likely to have done so in the U.S. (23 per cent), U.K. (12 per cent), France (9 per cent), China (8 per cent), India (6 per cent), or Germany (3.5 per cent).
- Nearly all of the 14,900 non-immigrants who earned their PhDs abroad did so at institutions in one of only three countries—the U.S. (67 per cent), U.K. (18 per cent), and France (6 per cent).

Career Expectations of PhD Graduates in Canada

Conventionally, in the university setting, PhD programs are often viewed as apprenticeships in academia for academic careers.¹⁴ The majority of students begin PhD programs with the intention of becoming a university

13 All data below are Conference Board calculations based on Statistics Canada, 2011 *National Household Survey*, Catalogue no. 99-012-X2011042.

14 Maldonado, *So You Want to Earn a PhD?* 16.

professor. In Ontario, for example, 65 per cent of all PhD students (86 per cent in the humanities) pursued their degree with the intention of becoming a university professor.¹⁵ Skills, attitudes, and behaviours cultivated through PhD programs in some fields tend to support this expectation. This sustains a pervasive culture or “dominant narrative” in which “success” for a PhD graduate is understood primarily in terms of finding employment as a tenure-track professor at a university.¹⁶

The academic career narrative is less strong in more applied fields such as engineering, architecture, and health. And other empowering views about the purpose of PhD education are gaining traction. For example, Paul Yachnin, Director of the McGill Institute for the Public Life of Arts and Ideas, suggests that the PhD is really “training for public life.”¹⁷ In a presentation to the annual meeting of the Canadian Association for Graduate Studies, Université de Montréal, Professor Frédéric Bouchard asserted that “the PhD is intended to train researchers. Some of them go on to become academics. Not the other way around.”¹⁸ These alternate views are gaining currency among academics.

Where Are PhDs Employed?

Careers in the Academy

Since only 18.6 per cent of employed PhDs in Canada are employed as full-time professors, it is clear that the traditional “dominant narrative” is too limiting. In fact, when we look at all PhDs aged 25 to 64 in the labour force (not only those who are employed), the proportion in full-time,

15 Maldonado, *So You Want to Earn a PhD?* 16; Desjardins and King, *Expectations and Labour Market Outcomes of Doctoral Graduates from Canadian Universities*.

16 MLA Task Force on Doctoral Study in Language and Literature, *Report of the MLA Task Force on Doctoral Study*, 6.

17 Paul Yachnin (Director, McGill Institute for the Public Life of Arts and Ideas), interview with Daniel Munro, November 26, 2014.

18 Bouchard, *How to Train Students to Find Post-PhD Opportunities*.

tenure-track university professor positions falls to about 16 per cent.¹⁹ Including PhDs employed as part-time university professors, research and teaching assistants, college instructors, administrators, PSE support staff (e.g., career services professionals), and postdoctoral scholars, nearly 40 per cent of employed PhDs work in the post-secondary education (PSE) sector.²⁰ (See Chart 4.) This includes 6 per cent employed as part-time professors and 7.4 per cent employed as research and teaching assistants—who would likely prefer full-time professor positions. Similarly, the 4.4 per cent employed as postdoctoral

Chart 4

Where Are Canada's PhDs Employed?

(percentage in sector or occupation, 2011)



Sources: Statistics Canada, National Household Survey, 2011; Canadian Association of Postdoctoral Scholars; The Conference Board of Canada.

19 The analysis in this section includes all employed PhDs of any age, rather than the 25 to 64 cohort. The broader age range is used to capture employed PhDs aged 65 and over who, in 2011, made up nearly 9 per cent of full-time university professors.

20 Due to the manner in which data is collected, PSE administrators may choose to self-categorize themselves as full-time university professors or managers. Similarly, the category “education, law and social, community, and government services” may include individuals with PhDs employed in non-management, research, or teaching occupations in the PSE sector (e.g., individuals working in PSE support services such as career services). Due to the inability of separating individuals in these categories employed in the PSE sector from those employed in the broader economy, we have not included these categories in our estimate of the number of PhDs employed in the PSE sector.

scholars²¹ hold positions that are temporary by design—usually lasting between one and five years—before the scholar moves to a more permanent position inside or outside PSE.²²

Changes in the way PSE-related occupations were classified for the 2011 census, relative to the 2006 and 2001 censuses, make comparisons over time difficult. However, it appears that even as the number of PhDs increased from 2006 to 2011, the proportion employed as full-time university professors held steady at just under 19 per cent. The proportion employed as part-time professors climbed slightly, from 5 per cent in 2006 to 6.1 per cent in 2011. In general, however, there appear to be no major recent shifts in the way PhD employment is distributed across the economy.

Predicting future trends in PSE employment for PhDs is difficult. On the supply side, domestic PhD production tells only part of the story.²³ Half of all PhDs in Canada are held by immigrants who earned them either as international students at Canadian universities—and subsequently stayed in or returned to Canada—or from institutions in other countries before they migrated to Canada. This means a large portion of the supply of PhDs is determined not by the Canadian PSE sector, but by the immigration system. Moreover, as nearly 10 per cent of all PhDs in Canada were earned by Canadians studying abroad, there is another sizable portion of the supply of PhDs not within the control of the Canadian PSE system itself.

21 Although precise data on the number of postdoctoral scholars are not collected, the Canadian Association of Postdoctoral Scholars estimates that there were 6,000 in 2009. Data from previous years suggests annual growth rates in postdoctoral scholars of between 5 and 8 per cent. Based on these numbers, we estimate that, in 2011, there were between 6,500 and 7,000 postdoctoral scholars employed in Canadian universities. For Chart 4, we used an estimate of 6,750 postdoctoral scholars for 2011.

22 Mitchell, and others, *The 2013 Canadian Postdoc Survey*, v.

23 On increasing PhD program enrolments and the factors driving further increases, see Moldanado, Wiggers, and Arnold, *So You Want to Earn a PhD?* 8–15; and Fallis, *Rethinking Higher Education* 157–73.

On the academic demand side, the need for full-time professors will be determined by demographics, university participation rates, trends in international student enrolment, and the changing nature of employment contracts for faculty at Canadian universities. With some of those factors driving in opposite directions, the size and nature of overall demand is not likely to change too much in the next several years.

Interestingly, the federal government's Canadian Occupation Projection System projects a shortage of university professors (NOCS 4121) to 2020. It estimates that there will be 44,328 new job openings in this category between 2013 and 2020, but only 39,030 projected job seekers (consisting of new graduates and immigrants with PhDs).²⁴ However, the model underestimates the supply of PhD job seekers for academic positions. Over that period, Canada will attract or graduate roughly 100,000 individuals with PhDs. The model holds that only 39,030 of them will seek academic employment because it assumes that the employment realities of current PhDs reflect how future PhDs will want to be employed. But, as we know, many PhDs who are working in PSE, but are not currently employed in tenure-track positions, would likely prefer such positions. Instead of using the employment status of current PhDs as a predictor of the proportion of the future PhD cohort that would pursue academic positions (i.e., a revealed preferences assumption), we could look at the actual preferences of current PhD students to predict academic supply. In that case, at least 60 per cent of future PhDs are likely to aspire to academic careers (at least upon commencing their studies). Using that assumption, supply would be at least 60,000—much higher than the 44,328 predicted job openings, and thus indicative of a future surplus that could be available for PSE academic roles.

24 Employment and Social Development Canada, *COPS: University Professors and Assistants*.

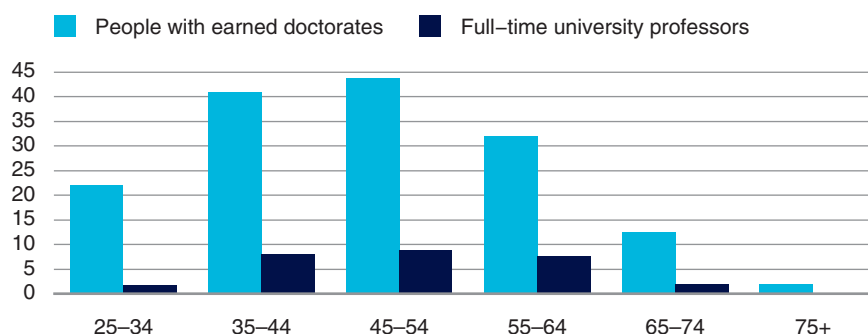
Delayed Retirements Are Not a Major Issue

Prospects for academic employment among younger PhDs have not been significantly hurt by older cohorts of PhDs delaying retirement. A look at the academic employment of PhDs by age cohort shows that delayed retirement is not a significant factor limiting academic career prospects for younger cohorts. (See Chart 5.) Among the 14,330 employed PhDs aged 65 and older, 2,075 (14.5 per cent) are employed as full-time university professors. If all full-time university professors aged 65 and older retired and their academic positions went to PhDs aged 25 to 54, the academic employment rate of that younger cohort would rise by 2 percentage points—from 17.5 per cent to 19.5 per cent. While this increase is not insignificant, the majority of PhDs graduates would still need to pursue careers outside academia.

Chart 5

Academic Employment of PhDs in Canada, by Age Cohort

(number, 000s)



Sources: Statistics Canada, National Household Survey, 2011; The Conference Board of Canada.

Furthermore, while some believe that the low academic employment rates of PhDs is a relatively new phenomenon, the age cohort data reveals that such low rates have likely been with us for decades. In

fact, higher education researcher, Melonie Fullick, has found that low academic employment rates and debates about this issue in Canada stretch back at least to the early 1970s.²⁵

Careers Outside the Academy

Employment in non-academic careers is the norm, not the exception. PhD holders are employed in occupations in the natural and applied sciences (17 per cent); health (11 per cent); law and social, community and government services; and education other than PSE (11 per cent). Many are also employed as managers across the economy (9.5 per cent), or in other business, finance, and administrative occupations (5.3 per cent). Smaller numbers are employed in occupations in art, culture, recreation, and sport (2.3 per cent); sales and service (2.6 per cent); and other occupations (1.4 per cent).²⁶

In all fields of study, PhDs are more likely to be employed in a non-academic sector than as full-time university professors. (See Table 1.) For example, while 6.8 per cent of PhD graduates of health-related programs are employed as full-time university professors, 63 per cent are employed in non-academic occupations in the health sector. Graduates of architecture and engineering programs are almost three times as likely to be employed in occupations in the law and social, community and government services, or education (other than PSE) category (44 per cent) as they are to be full-time university professors (15 per cent). Similarly, although 15 per cent of physical and life sciences PhDs are employed as full-time university professors, twice as many (30 per cent) are employed in non-academic careers in the natural and applied sciences. In the humanities, only 30 per cent of PhDs are employed as full-time university professors, while 19 per cent are employed in occupations in law and social, community and government services, and education other than PSE—the next most common category of employment for humanities PhD graduates.

25 Fullick, “PhD ‘Overproduction’ Is Not New.”

26 Calculations based on Statistics Canada, *2011 National Household Survey*, Table 99-012-X2011035.

INSIDE AND OUTSIDE THE ACADEMY
Valuing and Preparing PhDs for Careers

Table 1

PhDs Employed Inside and Outside the Academy, by Field of Study

(per cent)

Field of PhD study	Full-time university professors	Top non-PSE category of employment	Top occupational category
Business, management, and public administration	31.7	32.4	Business, finance, administration, management
Humanities	29.7	19.4	Education (not PSE); law; social, community, and government services
Mathematics, computer, and information sciences	26.5	29.9	Natural and applied sciences and related occupations
Social and behavioural sciences and law	23.9	37.7	Education (not PSE); law; social, community, and government services
Education	23.3	24.8	Education (not PSE); law; social, community, and government services
Physical and life sciences, and technologies	15.1	29.8	Natural and applied sciences and related occupations
Architecture, engineering, and related technologies	14.7	43.8	Natural and applied sciences and related occupations
Agriculture, natural resources, and conservation	12.9	24.5	Natural and applied sciences and related occupations
Health	6.8	62.8	Health

Sources: NHS Table 99-012-X2011035; custom tabulation.

With the exception of graduates in mathematics, computer, and information sciences, PhD graduates from programs in the sciences, engineering, and health are much more likely to be employed outside the academy than are graduates of humanities, education, and the social sciences. Indeed, it appears that programs of a more applied nature have graduates who are more likely to be employed in careers outside of PSE. The high proportion of graduates of mathematics, computer, and information science programs—employed in academia relative to other sciences—appears to undermine this conclusion. But the reality is that mathematics, which makes up half of the graduates from this category, has more in common with theoretical disciplines

like philosophy than with those sciences that have a significant applied dimension— such as engineering, physical sciences, health, and other “STEM” categories. But, like philosophy graduates, mathematics PhDs have skills that make them suitable for a wide range of non-academic occupations outside of PSE.

Employment Outcomes for PhDs in Canada

On average, PhDs in Canada have good employment outcomes. (See Table 2.) For example, when comparing 2011’s master’s and PhD holders aged 25 to 64, PhDs in Canada had:

- a labour force participation rate of 89.3 per cent, versus 86.3 per cent for master’s degree holders;
- an employment rate of 85.6 per cent, versus 81.9 per cent for master’s degree holders;
- an unemployment rate of 4.1 per cent, versus 5 per cent for all master’s degree holders.²⁷

Table 2

Employment Outcomes, by Level of Education

(per cent)

Highest level of education obtained	Participation rate	Employment rate	Unemployment rate
All education levels	80.3	75.3	6.2
High school diploma or equivalent	76.7	71.4	6.9
College, CEGEP, or other non-university certificate or diploma	84.9	80.6	5.2
Bachelor’s degree	86.3	82.4	4.5
Master’s degree	86.3	81.9	5.0
PhD degree	89.3	85.6	4.1

Source: Statistics Canada, National Household Survey, 2011.

27 Statistics Canada, 2011 *National Household Survey*.

PhD graduates are highly trained, motivated people and these factors make them well-equipped to find and succeed in employment of some type.

Employment outcomes vary across a number of dimensions, including gender, field of study, where one's PhD was earned (i.e., at a Canadian institution or abroad), and citizenship. Furthermore, employment data does not indicate the extent to which PhDs are underemployed. For example, a survey of 2005 PhD graduates two years after graduation, found that 19 per cent of graduates felt they were overqualified for their position, and 30 per cent reported that less than a doctoral degree was required to obtain their current position.²⁸ PhD graduates are highly trained, motivated people and these factors make them well-equipped to find and succeed in employment of some type. But that employment may not make use of or reward them for their advanced skills. As such, we also examine the earnings of PhDs below.

Men With PhDs Fare Better in the Labour Market Than Women With PhDs

Men with PhDs have a labour force participation rate of 90.4 per cent, an employment rate of 87.2 per cent, and an unemployment rate of 3.6 per cent. By contrast, women with PhDs have a labour force participation rate of 87.5 per cent, an employment rate of 83.2 per cent, and an unemployment rate of 4.9 per cent.²⁹ The different employment outcomes are likely influenced by differences in fields studied, different career choices, and general barriers to women's equal employment. Still, on average, for both men and women, holding a PhD in Canada is associated with better employment outcomes than not holding a PhD.

Differences by Field of Study

Differences by field of study are somewhat more pronounced, although employment rates are relatively high for all fields. Employment rates reach a high of 88.3 per cent for those holding PhDs in mathematics, computer, and information sciences; and a low of 80.8 per cent for

28 Desjardins and King, *Expectations and Labour Market Outcomes*, 32.

29 Statistics Canada, *2011 National Household Survey*.

graduates of education programs.³⁰ (See Table 3.) Additionally, men with PhDs in health and related fields are least likely to be unemployed (2.5 per cent), while women in architecture, engineering, and related technologies, or agriculture, natural resources, and conservation programs, are more likely than other PhDs to be unemployed (7.1 per cent). In all but the latter cases, the unemployment rate for those with PhDs is below that reported for all Canadians in 2011 (6.2 per cent).

Table 3

Participation, Employment, and Unemployment, by Major Field of PhD Study, Men and Women Aged 25–64

(per cent)

Major field of study	Participation rate		Employment rate		Unemployment rate	
	Men	Women	Men	Women	Men	Women
All fields of study	90.4	87.5	87.2	83.2	3.6	4.9
Mathematics, computer, and information sciences	92.5	90.0	89.5	84.5	3.2	5.7
Physical and life sciences, and technologies	91.8	88.4	88.7	83.5	3.4	5.5
Architecture, engineering, and related technologies	91.3	89.2	88.0	82.9	3.6	7.1
Social and behavioural sciences and law	90.7	90.0	86.9	86.3	4.3	4.2
Agriculture, natural resources, and conservation	89.8	91.0	85.9	84.2	4.1	7.1
Humanities	88.8	83.1	85.2	78.0	4.0	6.1
Business, management, and public administration	88.0	84.3	85.2	79.6	3.3	5.8
Health and related fields	88.7	87.4	86.5	84.2	2.5	3.7
Education	86.3	82.2	82.5	79.8	4.4	3.0
Visual and performing arts, communications technologies	85.9	86.0	82.5	81.8	4.0	5.0

Source: Statistics Canada, National Household Survey, 2011.

30 Graduates of programs in personal, protective, and transportation services have a lower employment rate of 79.1 per cent, but the NHS reports only 215 graduates aged 25 to 64 in that category. Therefore, we have excluded them from this analysis.

Location of Study Matters More for Immigrants Than For Non-Immigrants

The proportion of PhDs held by immigrants and non-immigrants aged 25 to 64 is nearly equal (50.4 and 49.6 per cent, respectively). However, employment outcomes are significantly better for non-immigrant PhD holders than they are for immigrants with PhDs. (See Table 4.) Non-immigrants, whether they earned their PhD in Canada or abroad, have a labour force participation rate of just over 90 per cent, an employment rate of about 88 per cent, and a very low unemployment rate of 2.9 per cent.

Table 4

Employment Outcomes for PhDs, by Immigrant Status and Location of Study (Aged 25–64), 2011

(per cent)

	Participation rate	Employment rate	Unemployment rate
Total, immigrants and non-immigrants, any study location	89.3	85.6	4.1
Non-immigrants			
Any study location	90.5	87.9	2.9
PhD earned in Canada	90.6	88.0	2.9
PhD earned outside Canada	90.3	87.7	2.9
Immigrants			
Any study location	88.1	83.3	5.5
PhD earned in Canada	90.4	86.5	4.3
PhD earned outside Canada	86.6	81.2	6.2

Source: Statistics Canada, National Household Survey, 2011.

Although immigrants who earned their PhD in Canada have similar participation and employment rates as non-immigrants (90 per cent and 86.5 per cent, respectively), their unemployment rate is higher (4.3 per cent). Still, the immigrant PhD unemployment rate is lower than the unemployment rate of all individuals (of all educational levels) in 2011

(6.2 per cent). The situation is less rosy for immigrants who earned PhDs outside of Canada. This cohort has a labour force participation rate of 86.6 per cent, an employment rate of 81.2 per cent, and an unemployment rate of 6.2 per cent (equal to the unemployment rate for all education levels).

The differences in labour market outcomes for immigrants and non-immigrants can be attributed to two main factors. First, immigrants who earned their PhD abroad are less likely than non-immigrants to have studied in a country whose credentials are easily recognized and trusted by Canadian employers. Of the 14,900 non-immigrants who earned their PhDs abroad, more than 85 per cent earned them from an institution in the United States or the United Kingdom. By contrast, only 36 per cent of the 46,225 immigrants who earned their PhD abroad completed their studies in the United States or the United Kingdom. To see just how beneficial a PhD from the U.S. is, as opposed to other countries, consider that immigrants with PhDs from U.S. institutions had an unemployment rate of only 3 per cent—nearly even with non-immigrants' overall unemployment rate of 2.9 per cent and close to that of non-immigrants who also studied in the U.S. (2.4 per cent).^{31, 32}

Second, many immigrants—even those who studied in Canada—face a range of employment barriers, including less developed employment networks, language barriers, and racism. Although immigrants with PhDs earned in Canada fare much better than immigrants with lower educational attainment—and, in many cases, better than non-immigrants with lower educational attainment—these barriers contribute to a gap between immigrant and non-immigrant PhD employment outcomes.

31 All results calculated from 2011 National Household Survey, Table 99-012-X2011042.

32 The Conference Board's *Brain Gain 2015: The State of Canada's Learning Recognition System* (forthcoming) addresses the recognition of immigrants' learning and credentials.

Earnings

On average, PhD holders have higher earnings than others, but there is considerable variation by field of study, gender, and sector of employment. In 2005, PhDs had average annual earnings of \$94,200. That was slightly higher than the \$89,000 earned by master's degree holders, and considerably more than the \$71,300 earned by those with bachelor's degrees (including law degrees), \$48,200 for those with a college or CEGEP education, and \$41,200 for those with only high school.³³

For PhDs employed in universities as full-time teachers in 2005–06, average earnings were comparable. The average salary of full-time university teachers (all ranks combined) was \$93,235 in 2005–06—ranging from an average of \$65,445 for full-time lecturers to \$116,040 for full professors.³⁴ By 2010–11, full-time university teachers were earning an average of \$112,578—ranging from \$86,640 for lecturers to \$138,853 for full professors.³⁵

Earning Premiums

Over the period 1971 to 2006, PhD holders had average annual earnings of \$69,267 versus \$28,756 for high school graduates; \$45,793 for those with bachelor's degrees; and \$56,587 for master's degree holders.³⁶ (See Table 5.) Relative to other levels of education, PhDs earned, on average, a significant premium—from \$12,680 more per year than master's degree holders to \$46,569 more per year than those with less than a high school education.

33 Association of Universities and Colleges of Canada, *Trends in Higher Education*, 42. Although more recent data on the earnings of those with earned PhDs was collected in the *National Household Survey*, that data is not public nor was it obtained for analysis by the Conference Board.

34 Canadian Association of University Teachers, *CAUT Almanac of Post-Secondary Education* 2007, 5.

35 Canadian Association of University Teachers, *CAUT Almanac of Post-Secondary Education* 2013–2014, 6.

36 Stolarick, *The Changing Returns to Education in Canada*, 34. Figures reported in 2010 dollars.

Table 5

Average Wage Returns for Additional Educational Attainment 1971–2006

(210 \$)

Educational attainment	Mean	Annual premium					
		HS	SC	DEG	BACH	MAST	PHD
Less than high school (LTHS)	22,698	6,058	4,043	12,482	23,095	33,889	46,569
High school (HS)	28,756		–2,015	6,423	17,037	27,831	40,510
Some college (SC)	26,741			8,439	19,052	29,846	42,526
College degree (DEG)	35,180				10,613	21,407	34,087
Bachelor's degree (BACH)	45,793					10,794	23,474
Master's degree (MAST)	56,587						12,680
Doctoral degree (PHD)	69,267						

Source: Stolarick, *The Changing Returns to Education in Canada and its Provinces: 1971–2006*.

On the other hand, PhD holders study longer, forgoing income for years. Earning a PhD typically takes 8 to 12 years of study (or more) after completing high school, giving those with lower educational attainment an earnings head-start and initial advantage, which takes some time for a PhD graduate to catch and pass. To illustrate, compare a PhD who takes five years to finish his or her degree to a master's graduate. If the PhD student had no paid employment during that time (which is unlikely given the nature of PhD funding), the master's graduate will have earned \$282,935 more than the PhD graduate by the time the PhD is earned. (See "Funding for PhD Students.") With an average annual income of \$69,267 or \$12,680 more than the master's graduate—it will take the PhD graduate just over 22 years—a substantial part of his or her working life—to close the cumulative earning gap. As such, while PhDs do see positive returns over master's graduates, these returns are modest and, on average, the earnings of PhD graduates will not surpass master's graduates until the later stages of their career.

Funding for PhD Students

PhD students in Canada typically receive funding to pursue their studies. Funding for PhD students may include fellowships, scholarships, or awards, and teaching and research assistantships. For example, at the University of Toronto, "... for eligible graduate students, funding packages range from a total support package of \$23,448, or an amount equal to the cost of academic tuition and fees plus \$15,500, to an average income of \$35,109 (2012–13)." And, the University of Ottawa provides PhD students with a minimum of \$18,000 per year for a period of four years.³⁷ The amount and duration of funding packages that PhD students receive vary by discipline. Many programs limit funding to four or five years, which, in many disciplines, is less than the average time to complete a PhD.

Canada's PhDs appear to have lower earnings than peers in the United States. Over the 1990s, the real earnings of PhDs in Canada grew by only 3 per cent while in the U.S., they grew by 18 per cent.³⁸ Part of this may be due to more rapid growth in the supply of PhDs in Canada than in the U.S. during this period, and the fact that U.S. firms make greater use of university-educated workers than Canadian firms generally. (Canadian firms are much more likely than U.S. firms to rely on college-educated rather than university-educated workers).³⁹ A greater number of U.S. firms may recognize the value of the PhD credential, compared with other credentials, than Canadian firms do. Another potential factor is differences in the size of research and innovation intensive industry sectors between Canada and the United States. Thus, on average, U.S. employers may have more need and can generate more value from using PhDs in their business operations. For example, U.S. firms spend more than Canadian firms on developing new and improved

37 University of Toronto, *Financing Your Graduate Education*; and University of Ottawa, *Admission Scholarships*.

38 Boothe and Roy, "Business Sector Productivity in Canada," 8–9.

39 Ibid., 8.

products for their domestic market. And, the U.S. government spends considerably more than the Canadian government on the procurement of advanced technologies.⁴⁰

Men With PhDs Earn More Than Women With PhDs

Although PhDs generally earn more than those with lower educational attainment, there are substantial differences in the earnings of male and female PhDs. On average, during 1971 to 2006, men with PhDs had annual earnings of \$79,228 versus \$56,501 for women with PhDs—a difference of nearly \$23,000.⁴¹ In fact, women with PhDs earn \$17,615 less than men who held only master's degrees, and nearly \$7,000 less than men who held only bachelor's degrees. To be sure, women with PhDs earned more than women with lower educational attainment, and the wage gap between men and women narrows as educational attainment increases. Still, the earnings gap between male and female PhDs is striking.

Part of the gap can be attributed to the field of study, with women more likely to earn a PhD in fields generally offering lower wages. But there are wage differences even within fields. For example, in 2007, only two years after graduating, men with PhDs had higher median earnings than women with PhDs in education (\$8,000 more annually); psychology, and social sciences (\$7,000); engineering (\$4,000); and humanities (\$4,000). However, women had higher median earnings than men in life sciences (\$7,500), and had median earnings that were nearly equal to men's in computer science, mathematics, and physical sciences.⁴²

40 See for example, World Economic Forum, *The Global Competitiveness Report 2014–2015*.

41 Stolarick, *The Changing Returns to Education in Canada*, 62.

42 Desjardins and King, *Expectations and Labour Market Outcomes*, 48.

Median incomes
for humanities
PhDs were
approximately
\$60,000.

Considerable Variation Across and Within Disciplines

Earnings vary across disciplines, as well as within disciplines. Earnings data for 2005 graduates of Canadian PhD programs across all fields of study show a median income of \$65,000 in 2007. But median incomes were as low as \$49,642 for men in the life sciences and as high as \$81,000 for men with doctorates in the category of “education and other fields of study.”⁴³

Of course, not all graduates earn the median income. Across all fields of study, those at the 25th percentile were earning less than \$50,000, while those at the 75th percentile were earning nearly \$80,000. In the life sciences, those at the 25th percentile were earning just over \$40,000, while those at the 75th percentile were earning approximately \$75,000. In education and other fields, incomes ranged from \$65,000 in the lowest quartile to over \$100,000 in the highest quartile. Median incomes for humanities PhDs were approximately \$60,000—higher than that of life science graduates—but humanities graduates had the lowest “high-end” earnings of all fields, with those in the 75th percentile earning less than \$70,000.⁴⁴

Weak Employer Demand and Challenging Transitions

Although many PhDs in Canada employed outside PSE earn good incomes, graduates and newcomers with PhDs face weak, explicit employer demand for their credentials and sometimes challenging transitions to full-time, well-paying employment. For example, only a small minority of firms with active research and development (R&D) programs actually employ people with PhDs. For instance, a survey

43 Ibid.

44 Ibid, 28.

of nearly 1,000 R&D-performing firms, commissioned by the Expert Panel on Federal Support to Research and Development, found that only 18 per cent had employees with PhDs.⁴⁵

Currently, relatively few Canadian firms appear to be explicitly looking to hire people with PhDs. Analysis of over 1 million distinct job ads listed in Canada during a three-month period (September to November, 2014), and a five-month period (March to July, 2015) revealed 4,000 ads that clearly listed a “PhD,” “doctorate” or “doctoral” degree as either required or preferred of candidates. Of those, more than 1,200 were for positions in the PSE sector. As many as 13,000 additional positions did not specifically request PhD credentials. But they were similar enough to other postings indicating that employers might want, or would benefit from, candidates with a PhD-level education.⁴⁶ In that case, roughly 17,000 positions listed during those eight months could be regarded as positions particularly suitable for PhD holders. Accounting for the fact that many “current” or still “open” listings are three-months-old or more, and given that nearly all of the academic jobs for the year would be captured in the September to December data (recognizing that posts prior to September would still continue to show up in the data), the figures cited above likely capture nearly all of the annual demand for PhDs in Canada.⁴⁷ In short, Canada may need as many as 17,000 PhD-holding job-seekers annually to fill key positions across the economy. In that case, the current supply and demand of PhDs may be in close

45 Expert Panel on Federal Support to R&D, *Innovation Canada*, 5.

46 Analysis by the Conference Board is based on data from WANTED Analytics. Four thousand jobs posted either between September and November, 2014, or March to July, 2015, explicitly listed a PhD credential as required or preferred for employment. The company estimates that an additional 13,000 posted positions are similar enough in language and other requirements that employers might want, or benefit from, candidates with PhDs, even though the ads do not explicitly ask for that credential. WANTED Analytics electronically spiders or crawls more than 25,000 websites—including job boards and corporate websites—to collect 2.5 million job postings a week from 22 countries. The business detects and sorts duplicate job entries, including those that use differing terminology (e.g., Toronto and the GTA). Job ads with criteria that have been revised are also detected.

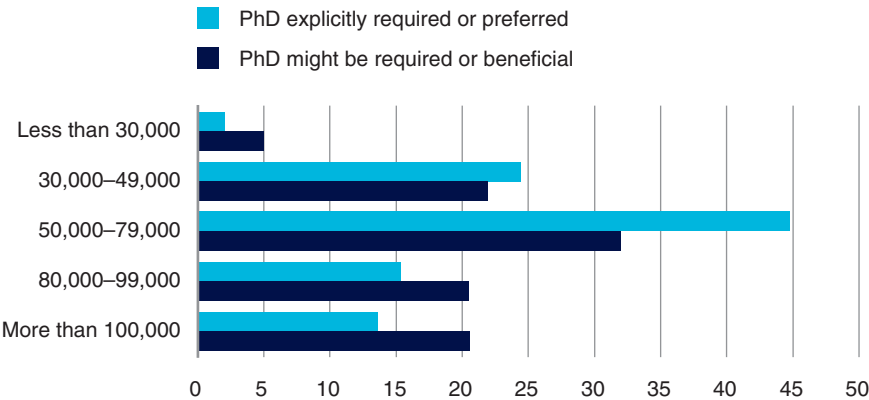
47 These are very rough estimates with many assumptions built in. The data upon which accurate annual demand could be made are simply not available. We provide these estimates, not to guide planning in PSE institutions or the immigration system, but to highlight the general contours of the employment situation that PhD graduates face.

equilibrium. However, it is difficult to know the extent to which employers prefer to hire PhDs for the positions that do not specifically require or prefer PhDs or the extent to which PhDs are able to utilize their skills in these positions. Furthermore, we do not know whether the demand for specific kinds of PhDs—e.g., computer science and engineering graduates versus humanities and fine arts graduates—is sufficiently aligned with the distribution of supply of PhDs by discipline.⁴⁸

Starting Salaries

The demand picture appears somewhat less rosy for PhD graduates when we examine salaries for posted positions. More than 26 per cent of currently active positions, which explicitly require or prefer a PhD, list annual salaries of less than \$50,000. (See Chart 6.) Given the financial investment many graduates have made, as well as the income they

Chart 6
Employer-Listed Salary Ranges for Positions Suitable for PhD Graduates
(percentage of positions in range; C\$)



Sources: The Conference Board of Canada; Wanted Analytics.

⁴⁸ This is a challenging issue across the OECD. See Pedersen, “New Doctoral Graduates in the Knowledge Economy”, 637–39.

While employers may feel PhD graduates have valuable skills, they may be concerned about the ability of PhDs to fit into a non-academic workplace and relate to non-specialists.

forego while studying for five to ten years, starting salaries in that low range are somewhat discouraging. While the vast majority of positions suitable for PhDs list starting salaries above \$50,000—including 29 per cent with salaries of \$80,000 or more—PhD students and graduates may have been expecting higher salaries than those seen here.

Employer Perceptions

The weak demand and less than ideal starting salaries may be explained in part by lack of awareness or misperceptions that some employers have about what PhDs can bring to their organizations. Employers with little or no experience of hiring PhDs may view them as too highly specialized, or may not be aware that the skills and tasks emphasized through the course of PhD studies (e.g., giving academic presentations, conducting extensive literature reviews, and writing lab reports) have direct applicability to the workplace. Employers may view PhDs as overspecialized in some areas, while lacking skills in others.⁴⁹ In many cases, employers may see value in the completion of a PhD degree but may not value the PhD as highly as the five to seven years' work experience that an individual may have gained instead of completing a PhD program.⁵⁰ In other instances, while employers may feel PhD graduates have valuable skills, they may be concerned about the ability of PhDs to fit into a non-academic workplace and relate to non-specialists.⁵¹

Employers who actually hire and work with PhD graduates have more positive views about their contributions. In a survey of employers in the U.S., those who employ PhD and master's graduates "... clearly indicate that graduate degree holders bring value to their organization. Employees with graduate degrees are viewed as having the advanced knowledge and, frequently, real work experience that allows them

49 Arnold, "Overqualified or Underqualified?"; *The Economist*, "The Disposable Academic"; Rose, *Graduate Student Professional Development*, 7.

50 Raddon and Sung, *The Career Choices and Impact*, 56.

51 *Ibid.*, 68.

to quickly lead and design projects.”⁵² And a study on the career trajectories of European PhDs found that firms that already have PhDs on staff, and which have well-established research capacity, were more likely to see PhDs as providing value and providing smoother transitions to new PhD-holding employees than firms that had no track record of hiring PhDs.⁵³ In both cases, employers noted that some PhDs lack certain skills that contribute to success. But the recognition of value was clear. The challenge, however, is that those organizations who do not already employ PhDs do not have first-hand experience, which would counter misperceptions.

Challenging Initial Transitions

The realities of relatively weak employer demand for PhDs, modest starting salaries, low employer awareness, and misperceptions about the value of PhDs—as well as gaps in certain skills and dispositions among some graduates—contribute to challenging initial career transitions outside PSE for many PhDs. Many PhDs find that they need to make an extra effort to “sell” themselves to employers by explicitly demonstrating that their knowledge and advanced skills make them especially valuable candidates for employment.

A recent OECD report notes that PhD graduates’ transitions into non-academic careers have become more, not less, challenging in recent years. Although from 1990–2006, PhD graduates across selected OECD countries had low unemployment rates of 2 to 3 per cent, the report notes that the transition to full employment can take up to four or five years for recent graduates.⁵⁴ In the countries studied, recent graduates (who received their PhDs no more than three or four years before

52 Council of Graduate Schools and Educational Testing Service, *Pathways Through Graduate School*, 10.

53 Cruz-Castro and Sanz-Menéndez, “The Employment of PhDs in Firms,” 57–69.

54 Auriol, *Careers of Doctorate Holders*, (Table 2), 11.

employment data were collected) tended to have higher unemployment rates, and lower employment rates, than earlier graduates (who received their PhD four or more years before data collection).⁵⁵

In Canada, a study of the 2007 labour market outcomes of 2005 graduates found that 80 per cent of graduates were employed; another 5 per cent were self-employed; 8 per cent were out of the labour force (usually pursuing more education); and 6 per cent were unemployed—an unemployment rate well above the rate for all PhDs in Canada.⁵⁶ Excluding those not in the labour force, the unemployment rate climbed to 7 per cent for all PhDs. But the rate varied substantially across disciplines, with 2005 humanities graduates reporting 16 per cent unemployment in 2007, and education graduates reporting 3 per cent unemployment.⁵⁷ Additionally, across all fields of study, 8 per cent of 2005 graduates were employed part-time, while 18 per cent of 2005 humanities PhDs and 15 per cent of psychology and social science PhDs were employed part-time.⁵⁸

Valuing and Preparing PhDs

In general, PhDs fare quite well in the Canadian labour market. Employment and earnings outcomes are generally good, and many PhDs are satisfied with their careers, whether they are employed in academic or non-academic careers. But there are areas for concern. Employment and earnings outcomes for women and immigrants with PhDs are considerably weaker than those of men and non-immigrants with PhDs. Outcomes vary considerably across and within fields of study. And regarding the likelihood of securing a tenure-track position, the

55 Ibid., 27.

56 Desjardins and King, *Expectations and Labour Market Outcomes*, 27.

57 Ibid., Table A.14, 47.

58 Ibid., Table A.15, 47.

INSIDE AND OUTSIDE THE ACADEMY
Valuing and Preparing PhDs for Careers

expectations of many students entering PhD programs are substantially misaligned with PhD career realities. But, students do become more aware of the likelihood of securing a tenure-track position as they progress through their studies. However, while many PhDs face difficult career transitions upon completing their degree, most ultimately go on to rewarding, well-paying careers in a wide range of fields.

CHAPTER 3

Inside and Outside the Academy: The Value of a PhD in Canada

Chapter Summary

- PhD graduates make valuable intellectual, social, artistic, cultural, and economic contributions—both inside and outside the academy.
- Knowledge, skills, and dispositions—including deep understandings of specific fields; advanced research, analysis, and communication skills; and creative, detail-oriented, and persistent personalities—make PhDs well-suited to advancing innovation both inside and outside academia.
- Although PhDs are important contributors to firm-level and national innovation and productivity performance, the evidence is unclear about whether having a PhD is a necessary condition for making such contributions.
- The amount of economic benefit to be gained from increasing the number of PhDs in Canada depends on how effectively employers can utilize the PhDs' skills and knowledge.

Increasing the education level of individuals, including boosting the number of PhDs, is generally seen as a way to create a more enlightened, productive, and advanced society. PhDs, with their elevated knowledge and expertise, are well-positioned to create new firms and jobs, enhance social services, address health challenges, contribute to arts and culture, and improve the sustainability and functionality of our natural and built environments.

However, while a highly skilled population is integral to an innovative, advanced society, there is limited research on the value that PhDs bring to a wide range of non-academic careers. Previous assessments of the value of the PhD credential focus heavily on economic dimensions—particularly salary premiums. While there is some research on the impact that PhDs have on productivity and innovation, much less is known about the specific, quantifiable contributions made by PhDs.¹

The evidence that exists suggests that PhDs can make valuable contributions in a wide range of fields. Less clear is the extent to which a PhD is a prerequisite to making such contributions. Given the high public and private costs associated with completing a PhD, it is worthwhile to assess the value of the PhD degree in Canada beyond salary comparisons. Does having a PhD prepare individuals to make unique contributions to economic performance and social well-being above and beyond the contributions of individuals without PhDs?

¹ For exceptions, see Raddon and Sung, *The Career Choices and Impact*; Tzanakou, *Beyond the PhD*.

This chapter discusses the individual benefits and costs of pursuing a PhD, examines the skills individuals gain through the completion of a PhD, and provides an analysis of the contributions of PhDs to the following areas:

- economy (entrepreneurship, innovation, productivity);
- society (health, community well-being, social services, public policy);
- arts and culture (literature, music, fine arts, media).

Individual Benefits and Costs of Pursuing a PhD

Individuals pursue PhD studies for a wide range of reasons in addition to economic ones, including the intrinsic value of mastering a field of knowledge, personal satisfaction derived from completing original research, and the prestige and sense of accomplishment of earning the title “doctor.”² At the same time, completing a PhD requires considerable personal sacrifice, including time away from the labour market—and thus delayed earnings and savings. The intense workload and relative isolation of PhD studies may lead to mental health challenges for some students,³ as well as delayed family formation.

In some instances, specialization associated with PhD research can narrow employment opportunities beyond those that are based primarily on research expertise. Research conducted for the PhD typically has a narrow, deep focus, which may make it challenging for some employers to see which relevant skills and knowledge a PhD can bring to their organization. Employers may also worry that PhD graduates lack “real world” experience, and some recent graduates share these worries.⁴ Furthermore, while labour market demand for all types of credentials

2 Raddon and Sung, *The Career Choices and Impact*, 77; Tzanakou, *The Value of the PhD in a Knowledge-Based Economy*.

3 See, for example, Anonymous, “There Is a Culture of Acceptance Around Mental Health Issues”; and, Fullick, “My Grief Lies All Within.”

4 Group of Eight, *The Changing PhD*, 30.

The specialized knowledge and skills that PhD graduates acquire are valuable in a range of careers.

is difficult to foresee, it is more difficult to predict in the case of PhDs due to the length of time required to complete a PhD and the specialized nature of PhD studies.

Difficult career transitions and negative employer perceptions of PhD graduates underscore the need to better articulate and understand the value of the PhD. The information can help prospective students, graduates, and employers make better decisions about PhD studies and employment opportunities.

Knowledge and Skills Gained Through PhD Studies

Although relatively few advertised occupations explicitly require candidates to have a PhD (perhaps not surprising given that less than 1 per cent of the adult population holds one), the specialized knowledge and skills that PhD graduates acquire are valuable in a range of careers. Indeed, in completing a PhD, individuals typically develop a wide range of skills—subject matter expertise, technical skills, and employability skills. Of course, the skills an individual develops will vary based on their discipline, dissertation, other work experience (both inside and outside academia), and individual aptitude. For example, a biochemistry PhD may have considerable technical skills related to working in a lab, as well as experience working as part of a team in a lab. A sociology PhD may have experience teaching undergraduates (including the ability to mentor others, teach new concepts or skills, and facilitate group discussions), as well as a deep understanding of qualitative methods such as surveys, interviews, and/or discourse analysis. But due to the solitary nature of some PhD studies in the humanities and social sciences, they may not have significant experience working as part of a team.

A PhD allows an individual to develop a deep subject matter expertise to a much greater extent than do bachelor's and master's degree holders. For example, the advanced knowledge of chemistry or biochemistry, acquired during PhD studies in those fields, is integral to

future developments in the pharmaceutical and biotechnology sectors.⁵ Specialized knowledge in fields such as economics, criminology, urban planning, and social services is valuable in public policy careers.⁶ Likewise, in-depth knowledge of the arts and history are essential to careers in galleries, museums, and other cultural institutions.

For many individuals, however, specialized knowledge gained through PhD studies may be less important than the more general, but nevertheless advanced, technical and employability skills they develop.⁷ The PhD allows individuals to develop a wide range of employability skills with applicability to a wide range of careers. These skills include:

- **Written and verbal communication skills.** Written communication skills are developed through the writing of the dissertation and shorter pieces such as abstracts, conference papers, journal articles, and book chapters. Verbal communication skills are developed through teaching undergraduate students, conference presentations, and seminars.
- **Analytical and problem-solving skills.** PhD dissertations focus on complex, multi-faceted topics. Individuals are required to define a problem or research question and form and defend independent conclusions based on evidence derived by applying a wide range of methodologies. PhDs must manage ambiguity and uncertainty in their research. In a world where the problems that businesses, society, and governments need to address are becoming more complex; touch on numerous issue areas; and where there is no agreed-upon solution, the analytical skills gained throughout the course of the PhD are uniquely valuable.⁸
- **Information management.** The PhD requires individuals to understand and synthesize large amounts of data. Individuals must be able to identify information with applicability to a given problem, and develop organizing principles to sort and evaluate information.

5 Raddon and Sung, *The Career Choices and Impact*, 67.

6 See, for example, Economic and Social Research Council, *Study of the Contribution of Social Scientists*.

7 Group of Eight, *The Changing PhD*, 35; Tzanakou, *Beyond the PhD*, 249.

8 Group of Eight, *The Changing PhD*, 35.

The PhD encourages individuals to be innovative and creative in order to make an original research contribution in their field.

- **Project management skills.** The completion of the PhD requires individuals to structure and carry out a research project with minimal supervision, highlighting their ability to work independently. In designing their research project, PhDs must plan ahead, recognize potential risks, and develop feasible timelines and budgets (particularly when fieldwork is required to carry out the project). They must maintain flexibility in light of changing circumstances.⁹

In addition, a PhD program also allows an individual to develop and strengthen a further range of employability skills—broad skills, attitudes, and behaviours that individuals need to succeed in any workplace. The PhD signifies that an individual has a strong work-ethic, considerable personal initiative, and is able to work independently with minimal supervision.¹⁰ The PhD encourages individuals to be innovative and creative in order to make an original research contribution in their field. It also demonstrates that an individual has a strong “learning ability” (i.e., the ability to teach themselves new concepts and reiterate them to others). The age of PhDs graduates means they have maturity and life experience, which graduates from undergraduate and master’s programs may lack.¹¹ Depending on the discipline and research experience of a PhD graduate, they may have experience supervising teams or junior researchers, as well as experience working as part of a team. PhD graduates may be able to move more quickly to senior management and strategic positions within an organization due to their ability to think clearly, collect and assess evidence, draw conclusions, and make decisions.¹²

9 For further discussion of the soft skills that individuals can be expected to gain through the completion of their PhD, see Bogle, *Good Practice Elements in Doctoral Training*; Group of Eight, *The Changing PhD*, Attachment 1; Polziehn, *Skills Expected From Graduate Students*; University of Michigan, *PhD Transferable Skills*; Yachnin and Yetter, *White Paper on the Future of the PhD*, 10–11.

10 While evidence suggests a link between work ethic and personal initiative and the completion of a PhD, it is less clear if the PhD develops such traits or if the completion of a PhD acts as a selection mechanism to identify individuals with a strong work ethic. See, for example, Swaminathan, “What Predicts Grad School Success?”

11 Interview findings.

12 Group of Eight, *The Changing PhD*, 36.

Economic Contributions of PhDs Beyond the Academy

Fuelling Innovation and Entrepreneurship Within Organizations

The growth in the number of PhDs in Canada and other countries has been fuelled, in part, by a belief that PhDs are integral to R&D and innovation. Innovation contributes to business productivity, which has a strong influence on Canada's prosperity and standard of living.¹³ As the OECD has stated, "Doctoral graduates play a key role in research and innovation for several reasons. Firstly, they are specifically trained for research, even if additional training is increasingly required after their doctoral studies through the occupation of postdoctoral positions; secondly, they hold a diploma at the highest education level and as such are considered to be the best qualified for the creation, implementation, and diffusion of knowledge and innovation."¹⁴

Surveys and interviews in Canada and internationally reveal that employers that do hire PhDs value their contributions to creativity and innovation within their organizations. For example, one employer interviewed for a U.S. study noted that "graduate degree holders, especially those with doctorates, provide the '... scientific and technological leadership to drive scientific discovery, inspire innovation, and solve tough challenges.'"¹⁵

Mitacs is a national program that allows PhD students to complete paid internships with Canadian businesses. Employers who hire PhD students through the Mitacs internship program see improvements in innovation, job creation, and other business outcomes.¹⁶ In a recent survey of businesses who have hired PhD students as Mitacs interns, two-thirds indicated that the results of projects undertaken by their interns will be commercialized. Twenty-five per cent of businesses that participated

13 Edge and Watt, *Business Leaders' Perspectives*.

14 Auriol, *Careers of Doctorate Holders*, 6.

15 Council of Graduate Schools and Educational Testing Service, *Pathways Through Graduate School*, 10.

16 The Mitacs Accelerate program is discussed in greater detail in Chapter 5.

The ability of PhDs to conduct cutting-edge research along with their analytical and problem-solving skills is especially valuable to innovative firms.

in the program created a new position to hire their intern permanently after the completion of their PhD, while 26 per cent of businesses said their participation in the program led them to hire other new employees. Other improvements that businesses attributed to their participation in the program included the identification of new market segments (34 per cent), market segment expansion (31 per cent), and cost savings (18 per cent).¹⁷

Indeed, the ability of PhDs to conduct cutting-edge research along with their analytical and problem-solving skills is especially valuable to innovative firms. One Irish company in the chemicals sector noted that the chemistry PhDs it hires bring knowledge and skills that are not seen in individuals who have completed a master's degree, including:

- depth of knowledge (including a deep understanding of narrow fields, such as inorganic chemistry) and the ability to apply this knowledge;
- close familiarity with the underlying theories and methodologies of scientific research;
- The ability to plan out a research project and complete that project without close supervision;
- significant experience working on cutting-edge research.¹⁸

The advanced technical skills of many PhDs, along with their ability to synthesize and translate complex ideas and large amounts of information for different audiences, make them well-equipped for monitoring technology trends and developments that may contribute to innovation. PhDs also have professional networks that include other researchers, which can fuel knowledge-sharing and technology transfer within an organization.¹⁹

¹⁷ Mitacs, *Mitacs Accelerate Outcomes*, 7–9.

¹⁸ Advisory Council for Science, Technology and Innovation, *The Role of PhDs in the Smart Economy*, 49.

¹⁹ *Ibid.*, 7.

PhDs and National Innovation Performance

There is a link between a country's innovation performance and the proportion of the population with a PhD, although the precise nature of that link is unclear. For example, countries that have a high number of patents as a per cent of their population (an indicator commonly used to measure innovation activity), such as Switzerland, Sweden, and Germany, also have relatively high proportions of PhD graduates. Similarly, countries that rank highly on business expenditures on R&D (BERD)—such as Finland, Sweden, and Switzerland—also have high numbers of PhD graduates as a proportion of population.²⁰ By contrast, Canada fares poorly—relative to international peers—on innovation indicators like patents and BERD, and on the number of PhD graduates it produces. In The Conference Board of Canada's *How Canada Performs: Report Card on Innovation*, Canada receives “D” grades for patents by population, BERD, and its number of PhD graduates.²¹

However, while higher numbers of PhDs likely improve a country's innovation capacity and performance, it may also be the case that countries strong on innovation have more resources to invest in creating more PhDs and using them productively in their economy. Even if increasing the number of PhD graduates can improve innovation performance, attention also needs to be paid to exactly how those graduates are employed throughout the economy. Industry must be willing and able to employ those graduates and structure their organizations in ways that allow employees to actively use the skills and knowledge they have acquired during their PhD studies. Canada's low BERD spending is likely one reason for the difficult career transitions facing PhDs—increases in BERD spending would likely have a positive impact on the employment prospects of PhDs.

20 The Conference Board of Canada, *Advanced Skills and Innovation*.

21 The Conference Board of Canada, *How Canada Performs: Innovation*; The Conference Board of Canada, *How Canada Performs: PhD Graduates*.

Across OECD countries, there is a correlation between productivity and the proportion of a country's population holding a PhD.

PhDs and Productivity

The level of educational attainment in a country and its productivity are related, although the precise nature of this relationship is also unclear. In general, productivity rises with the educational attainment of a country's workforce—a relationship that holds with PhD attainment as well. Theoretically, PhDs may contribute to productivity improvements in at least two ways. First, more highly educated individuals may be additionally productive in the sense of being able to perform complex tasks and solve problems more efficiently and accurately than less-educated workers. Second, PhDs and others with advanced education may stimulate and assist organizations in adopting productivity-enhancing technologies and processes more often than organizations with less-educated workforces.²²

Across OECD countries, there is a correlation between productivity and the proportion of a country's population holding a PhD. (See Chart 7.) However, Canada's productivity level is already higher than its proportion of PhDs in the population might predict, highlighting how a number of factors influence productivity in addition to the number of PhDs.

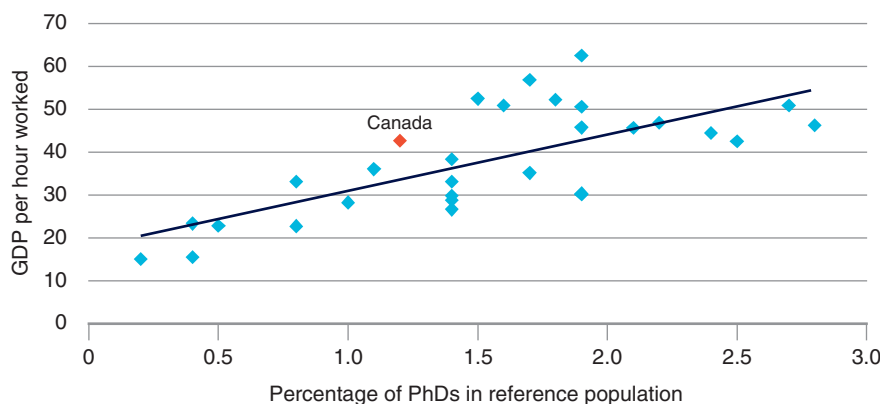
Those countries with the highest productivity rates typically have populations where PhDs make up more than 1.5 per cent of the population. This suggests that PhDs contribute to improved productivity at least up to a certain level of development. However, productivity gains are level once a country passes the 1.5 per cent threshold. This may be due to other factors at work in the economy. In some cases, there may not be enough jobs in the broader economy to fully utilize the advanced skills of PhDs and the associated productivity benefits they can generate. Or the mix of PhD credentials granted may not match the demand for specific credentials in the broader economy. As is the case with innovation, unless firms are able and willing to capitalize on the advanced skills of PhDs, many of the associated productivity gains are likely to go unrealized.

22 Casey, *The Economic Contribution of PhDs*, 222–23.

Chart 7

PhD Attainment Rates and Productivity in OECD Countries

(US\$; per cent)



Sources: OECD, Graduation Rates at Doctoral Level; OECD, GDP Per Hour Worked.

Other factors that influence productivity, such as firm investments in machinery and equipment, the creation of higher value-added products and services, and access to global markets are also important. Indeed, a recent report on STEM skills from the Council of Canadian Academies concluded that STEM skills are a “necessary, though not sufficient, condition for innovation, productivity, and growth.” The report noted that in addition to STEM skills, improving Canada’s productivity growth will require increased demand for these skills from business; strong soft skills such as communication, leadership, and teamwork; and, the complementary assets to bring ideas to market.²³

Social Contributions of PhDs Beyond PSE

PhD graduates make valuable contributions to health and social services, community well-being, and policy. PhDs whose dissertation research relates directly to their job can apply their research to improve how they approach day-to-day tasks, as well as sharing best practices

23 The Expert Panel on STEM Skills for the Future, *Some Assembly Required*, 152.

from recent research with their colleagues.²⁴ A PhD gives an individual the ability to delve deeply into issues and understand their meaning rather than just following processes and procedures. Indeed, the research skills developed through the course of a PhD allow individuals to research areas related to improving how they approach tasks associated with their positions.²⁵

For example, PhDs working in K-12 education may use their research skills to build their awareness of different approaches and teaching pedagogies. They can then apply this information to their own teaching practices as well as sharing it with their colleagues. One individual with a PhD in neuroscience who became an elementary school special education teacher found that his PhD research on neurologic disease has been valuable for teaching students with autism.²⁶ Similarly, PhDs working in health care settings may be able to better utilize existing research in a clinical practice setting, and generate additional knowledge related to their practical experience.²⁷

Furthermore, PhDs may be uniquely qualified to address issues related to ethics and justice. In particular, humanities and social science PhDs bring an understanding of the impacts of societal factors such as cultural, racial, and gender differences, and the historical forces that have shaped these differences.²⁸

A PhD can be a valuable asset in the creation and implementation of public policy. Individuals with a PhD play a valuable role in facilitating the adoption of new evidence and research methods from academia. A study of social science PhDs employed in the U.K. government found that they

24 Raddon and Sung, *The Career Choices and Impact*, 69.

25 Ibid., 69–70.

26 Polk, “Transition Q&A: Michael Ryan Hunsaker.”

27 Raddon and Sung, *The Career Choices and Impact*, 70.

28 Yachnin and Yetter, *White Paper on the Future of the PhD*.

are more intensely involved in a wider range of tasks than individuals with lower-level degrees, and play a greater role in project management, research procurement, and advisory work.²⁹

The possession of a PhD provides policy-makers with considerable credibility when advancing policy positions to individuals inside and outside government. The same study of social science PhDs employed in the U.K. government found that “the hierarchical stance of many in the Civil Service means that having a professional title can be a major asset at times” and that “a PhD also helps with the credibility of new ideas/initiatives that are of relevance to policy.”³⁰ A similar report on the impact of social science PhDs concluded that “possession of a PhD qualification provides the social scientist with an element of confidence and credibility in dealing with internal policy customers and external academics.”³¹

Individuals with PhDs are also more likely to progress to senior positions in government.³² The skills developed during PhD studies can have significant benefits for individuals holding senior positions in government or other organizations engaged in policy-related activities. These include communicating with technical experts and external academics; evaluating the quality of research; developing and testing policy ideas based on rigorous research methods; and specifying research objectives and methods when commissioning research from external organizations.³³

29 Juhlin, Tang, and Molas-Gallart, *Study of the Contribution of Social Scientists*, 7–9.

30 Juhlin, Tang, and Molas-Gallart, *Study of the Contribution of Social Scientists*, 7–9.

31 Johnson and Williams, *Evaluating the Impact of Social Scientists*, 1.

32 Ibid., 23.

33 Ibid.

PhDs interpret and contextualize works of art, literature, and historical events, and share their significance with society as a whole.

Arts and Cultural Contributions of PhDs Beyond the Academy

There is little research on the impact of PhDs in the arts and cultural industries. Research and anecdotal evidence that does exist suggests PhDs play an important role in creating and contextualizing the arts. The PhD teaches individuals to think creatively and imaginatively in how they approach problems. As Yetter and Yachnin state with regards to humanities PhDs, "... the humanities create new worlds of ideas, art, and practice that are beautiful, pleasurable, and rewarding in themselves—able to nourish individuals and communities over time and also productive of alternative frames through which to understand the present and imagine different futures."³⁴

PhDs interpret and contextualize works of art, literature, and historical events, and share their significance with society as a whole.³⁵ For example, PhDs both inside and outside academia provide expertise on historical periods and artefacts for museum exhibitions.³⁶ PhDs can play a lead role in the archival and interpretation of information of historical significance. This includes the design of new archival systems, and advice on the preservation of historical buildings and features in planning and development proposals.³⁷

PhD graduates also contribute to the creation of historically accurate works of literature, television, and film. For example, a U.K. PhD graduate in English became a lauded author of historical fiction for young adults as well as historical biography for a general audience. She noted that "the expertise in researching and interpreting historical information, developed while completing my thesis, proved essential in this type of

34 Yachnin and Yetter, *White Paper on the Future of the PhD*, 5.

35 British Academy, *Past, Present, and Future*, 34–35; Yachnin and Yetter, *White Paper on the Future of the PhD*, 5.

36 See, for example, Arts and Humanities Research Council, *Mapping Career Destinations—Dr. Catherine Horwood*.

37 Arts and Humanities Research Council, *Mapping Career Destinations—Dr. Andy Wigley*; Arts and Humanities Research Council, *Mapping Career Destinations—Dr. Melinda Hutton*; British Academy, *Past, Present, and Future*.

writing ... in addition, I found that having a PhD gives you credibility and gravitas with agents and publishers.”³⁸ In Canada, the Canadian War Museum has numerous historian PhDs on staff who ensure that artefacts and collections are genuine, and that exhibitions and displays are historically accurate and compelling for visitors.³⁹

Conclusion

PhD graduates make valuable contributions to innovation and productivity, social services, public policy, and arts and culture. It appears that the skills developed during the PhD can be leveraged further to make valuable contributions in a wide range of areas. However, the extent and impact of the contribution depends on how well employers are able to utilize the PhD’s knowledge and skills.

38 Arts and Humanities Research Council, *Mapping Career Destinations—Dr. Lydia Syson*.

39 Canadian War Museum, *About Us: Staff Directory*.

CHAPTER 4

What's Needed?

Chapter Summary

- The orientation of PhD programs toward academic employment, and the challenges associated with pursuing a non-academic career, make transitions to careers outside PSE difficult for PhD graduates.
- Some recent PhD graduates may lack skills required by non-academic employers, may face difficulties articulating the full range of skills developed during the process of earning the PhD, or expressing the value of their academic experience to employers. Employers often do not recognize the full value of the skills developed through PhD studies.
- Many PhD students have limited awareness of possible non-academic careers. Recent graduates often lack professional networks outside PSE, which could connect them with non-academic career opportunities.

Canada graduates an ample number of PhDs to sustain the supply of PSE educators and researchers it needs to carry out research, deliver education, and prepare the next generation of academics. However, PhDs do much more than educate advanced researchers for jobs within the academy. The majority of PhDs find jobs and careers outside of PSE, making valuable contributions to innovation and productivity performance. Arguably, PhDs could contribute more if both they and employers were better prepared to develop and use their skills and knowledge.

Universities can help PhD students prepare for productive careers outside the PSE system as well as within it. They can support their professional skills development and help them gain practical knowledge that will improve their transition to careers beyond PSE. Universities can also play a role in altering employers' misperceptions about the value and preparedness of PhD graduates. This chapter examines the challenging career transitions many PhDs face, and what is needed to ease those transitions.

Professional Development Challenges

While PhD graduates in Canada are generally satisfied with their educational experience, they are less satisfied with the career development and professional skills training they receive.¹ The 2013 Canadian Graduate and Professional Student Survey (CGPSS) found that only 51 per cent of PhD students had a positive assessment of the workshops and advice they received on careers within academia. As well, only 40 per cent had a positive assessment of the workshops

1 Sekuler, Crow, and Annan, *Beyond Labs and Libraries*, 4.

and advice they received on careers outside academia. Satisfaction decreases by year of study, with only 34 per cent of PhD students in year five or higher satisfied with the workshops and advice they received on careers outside academia. (Fewer than 50 per cent of students in the first or second year of their PhD were satisfied with workshops and advice they received on careers outside academia.) Thirty-six per cent of PhD students indicated they had used their university's career services—of those that did, only 62 per cent had a positive assessment of those services (compared with 67 per cent of students enrolled in research-focussed master's programs).²

A 2012 focus group held with Ontario PhD students found that many felt their PhD program did not adequately prepare them for a career outside academia, although this varied by area of study. Students in research-oriented programs expressed the strongest concerns, while those in professionally oriented programs (e.g., obstetrics and gynaecology, rehabilitation science) were less likely to be concerned. Professionally oriented programs tend to have clearer career pathways outside academia and integrate more professional skills development and career planning components into their programming. Students in fields with strong industry linkages were also less likely to express significant concerns about their career prospects, due to exposure to a wider range of career options and supervisors who were more knowledgeable about non-academic career paths.³

2 Arnold and Smith, *Students Weigh In*, 30–21; Arnold and Smith, *Students Weigh In* (supplementary tables), 21.

3 Sekuler, Crow, and Annan, *Beyond Labs and Libraries*, 4.

Some PhD students may be reluctant to explore career options outside academia due to a perception that doing so would make them a “failure” in the eyes of their peers and their supervisory committee.

Barriers to Successful Transitions

Cultural Barriers: Academic Apprenticeship as the Dominant Model

As noted in Chapter 2, most students enter PhD programs with the intention of pursuing a career as a tenure-track professor.⁴ In many respects, PhD programs are structured as a kind of “apprenticeship” to the professoriate (although this is changing in some programs). As Annan has stated, “The current system of Canadian graduate education is largely premised on the model of traditional academic mentorship, where graduate students are equipped to follow their supervisors into academic research positions. This mentorship provides students with only a single example and single path for professional development.”⁵ Indeed, while the skills most strongly emphasized throughout the course of the PhD—including the ability to conduct high-level research, publish academic papers, present at academic conferences, and teach undergraduate students—have broad applicability, they are most directly oriented toward an academic career.

As PhD students progress through their program, the number interested in tenure-track positions declines considerably.⁶ Yet, even as students become more interested in a variety of career paths as they approach graduation, their understanding of non-academic career paths is often limited. Some PhD students may be reluctant to explore career options outside academia due to a perception that doing so would make them a “failure” in the eyes of their peers and their supervisory committee.⁷

4 Maldonado, Wiggers, and Arnold, *So You Want to Earn a PhD?* 16; Desjardins and King, *Expectations and Labour Market Outcomes*.

5 Annan, *Research Internships and Graduate Education*; Maldonado, Wiggers, and Arnold, *So You Want to Earn a PhD?*; Rose, *Graduate Student Professional Development*.

6 Allum, Kent, and McCarthy, *Understanding PhD Career Pathways for Program Improvement*, 9; Sekuler, Crow, and Annan, *Beyond Labs and Libraries*, 3.

7 Interview findings.

Indeed, securing a tenure-track position at a highly ranked university is still generally viewed as the pinnacle of success for a PhD graduate. For example, the MLA Task Force on Doctoral Study observed that, “... diverse routes to satisfying and fulfilling careers do not fit the dominant narrative that centres on the replication of the current faculty. The covert, if not overt, message that many doctoral students hear is that success is measured by achieving a position comparable with or better than that of their advisor.”⁸ In voicing a desire to explore non-academic career opportunities, PhD students may fear their supervisor will see them as uncommitted to academia and their research.⁹

Some students may be so committed to an academic career path that they do not prepare for other career paths, especially at the early stages of their PhD. A U.S. survey of humanities PhD graduates in non-academic careers found that at the beginning of their studies 74 per cent planned to pursue a career as a tenure-track professor. Furthermore, at the outset of their studies, 80 per cent reported feeling fairly certain or completely certain that they would pursue a tenure-track job.¹⁰ Notably, these results refer to graduates who are now employed in non-academic jobs (including administrative positions in the higher education sector). And, as such, the percentage of students who feel certain they will pursue a tenure-track position upon graduation may be even higher.

These career expectations suggest that many PhD students begin their studies without a clear understanding of their future employment prospects.¹¹ Students who feel certain they will pursue a tenure-track job may be particularly resistant to participating in professional development initiatives, as they may incorrectly perceive that such initiatives offer little value for them.

8 MLA Task Force on Doctoral Study in Modern Language and Literature, *Report of the MLA Task Force*, 6–7.

9 Sekuler, Crow, and Annan, *Beyond Labs and Libraries*, 4.

10 Rogers, *Humanities Unbound*, 8–11.

11 *Ibid.*, 11.

Faculty Advisors' and Departments' Limited Knowledge of Careers Outside Academia

Some faculty members lack adequate knowledge of how to support and guide their students in non-academic job searches, due to their own relatively linear career path from PhD studies to academia.¹² In some instances, a faculty member's inability to advise students on non-academic career paths may mean they are mistakenly perceived as having a negative attitude toward students who pursue careers outside the academy. In actuality, they are simply at a loss as to how to help students.¹³ This issue is exacerbated by the limited connections many academic departments have with their PhD graduates in non-academic jobs. A lack of interaction with PhDs outside the professoriate makes it difficult for students to get a sense of the broader career opportunities they could pursue and the nature of the workplaces that might engage them. In some instances, an emphasis on pursuing an academic career path may lead PhD students to overlook valuable networking opportunities—for example, when interviewing individuals for their dissertation research.¹⁴

Limited Exposure To and Experience With Non-Academic Opportunities

The emphasis on the academic career path can make it hard for PhD students to articulate the value of the skills they gained through their PhD studies for non-academic careers. In many cases, individuals emerging from the PhD have limited work experience outside PSE. Some PhD students may mistakenly feel that the skills they have gained throughout the course of their studies have little relevance to non-academic jobs, particularly if their research focus does not have an obvious application to a non-academic workplace.¹⁵

12 Sekuler, Crow, and Annan, *Beyond Labs and Libraries*, 11; also see Lee and others, "Training the Trainers."

13 Interview findings.

14 Maldonado, Wiggers, and Arnold, *So You Want to Earn a PhD?* 27.

15 Interview findings.

Many employers want to see “job-ready” candidates with skills that have immediate value in a non-academic workplace.

Inadequate Professional Skills Development

Some new PhD graduates find they lack some of the skills and experience required by employers, which could circumscribe their career opportunities and limit them to jobs at a similar level to master’s degree graduates.¹⁶ Most recent PhD graduates lack the management experience required for many higher-level jobs. Other skills deficits that may hamper PhDs include writing and presenting to non-expert audiences, business and financial management skills, commercial acumen, experience working in a team, and the ability to work across disciplinary and cross-functional boundaries. However, the significance of these skills deficits will vary widely depending on the career path of the individual and their PhD program.^{17,18}

Employer Misperceptions

As noted above, these skills deficits are exacerbated by the negative perceptions of PhDs held by some employers. Employers may feel that PhDs are pursuing a career outside academia as a second-best option, and will go back to academia if given the opportunity. In some instances, employers do not recognize that the skills honed during PhD studies can allow individuals to make valuable contributions outside the academic sphere. Many employers want to see “job-ready” candidates with skills that have immediate value in a non-academic workplace. In particular, they value practical skills and PhDs who can easily integrate into the culture and values of their organization.¹⁹

- 16 Graduates from professionally oriented PhD programs may have an easier time in this regard as they may have specialized technical skills that are oriented to the needs of employers in their field.
- 17 De Grande and others, “The Skills Mismatch”; DOCENT, *Transferable Skills and Employability for Doctoral Graduates*, 31; Group of Eight, *The Changing PhD*, 38; Raddon and Sung, *The Career Choices and Impact*, 66.
- 18 For example, a U.S. survey of employers of humanities PhD graduates found that the top areas where graduates needed additional training were project management (85 per cent); technical skills (78 per cent); management (71 per cent); leadership (64 per cent); and administrative skills (59 per cent). See Rogers, *Humanities Unbound*, 15.
- 19 DOCENT, *Transferable Skills and Employability for Doctoral Graduates*, 30–31.

In a related vein, employers are less likely now than in the past to assume their own responsibility for training employees to succeed in their organizations. Canadian employers lag OECD peers in spending on training and development, and hours of training provided to employees. Moreover, over the past two decades, employer spending on training and development has declined by 40 per cent.²⁰ This decline is problematic. While employers can reasonably expect that new employees, especially those with PhDs, have a range of advanced skills, positive attitudes and a capacity to contribute and learn, they should not expect recent graduates to be perfectly prepared to fill specific jobs and roles without sufficient employer-provided orientation and training.

Easing Career Transitions for PhD Graduates

Many universities have launched initiatives to help PhDs transition into non-academic jobs, including online courses, workshops, internships, co-operative education placements, and modifications to the content and structure of PhD programs. Some faculty members may be reluctant to have their students participate in these initiatives due to concerns they lengthen the time students take to complete their degrees, and/or detract from the aim of preparing students for academic careers.²¹ However, surveys of PhD students find that the most common reasons for delays in degree completion are family or personal issues, financial challenges, distance from campus, mental health, and other professional responsibilities—not professional development. (See “PhD Completion Times.”) As Rose states, “To think of graduate education as including responsibility for workplace readiness ... represents something of a culture shift.”²²

20 Hall, *Learning and Development Outlook 2014*.

21 Interview findings; Osborne and others, “Preparing Graduate Students for a Challenging World of Work,” iv.

22 Rose, *Graduate Professional Development*, 6.

PhD Completion Times

Completion times in most PhD programs are long, and drop-out rates are quite high. Data from the U15 group of universities (the fifteen most research-intensive universities in Canada) found that the average time to complete a PhD ranges from five to six years depending on discipline. (Students in the social sciences and humanities, on average, take about one year longer to complete their degree than those in the sciences and engineering.)²³ However, many students will take much longer than this, and many will fail to complete their PhD—despite, in many cases, devoting years of study toward the PhD. A study of PhD graduation rates and completion times at eight research-intensive universities across Canada found that of students who began their studies in 2001, 70.6 per cent across all disciplines completed their degree in nine years. Completion rates ranged from 78.3 per cent in the health sciences, 75.4 per cent in the physical sciences and engineering, 65.1 per cent in the social sciences, and 55.8 per cent in the humanities.²⁴

Common factors that impact completion time include student–supervisor relationships, funding, and employment. In a 2012 survey of full-time PhD students at Queen’s University, respondents listed the following barriers to degree completion: poor quality supervision (28 per cent); personal and family responsibilities and issues (19 per cent); inadequate funding (12 per cent); program structure and technical issues—e.g., too many courses, mandatory requirements for fieldwork, equipment breakdowns and malfunctions, limited availability of test materials—(11 per cent); and employment (10 per cent).²⁵

Universities across Canada are taking steps to reduce completion times. Many universities have imposed time restrictions for the PhD. For example, McMaster University and the University of British Columbia impose a time limit of six years for the completion of a full-time PhD program, after which students must apply for a special exemption. Some PhD programs at Queen’s University have moved their comprehensive exams to earlier in the PhD process so students can begin

23 Tamburri, “The PhD Is in Need of Revision”; Vriend, “Time Limit Imposed.”

24 Tamburri, “The PhD Is in Need of Revision.”

25 Queen’s University School of Graduate Studies, *Survey on Doctoral Completion Time*, 5–6.

their dissertation research sooner.²⁶ Concordia University offers completion bonuses to students who finish their degrees on time.²⁷ Some schools are now publishing the completion times for their PhD programs on their websites.²⁸

Effective professional development initiatives address three core challenges facing PhDs:

- limited awareness of career options outside PSE;
- weak ability to access job opportunities;
- insufficient skills to succeed in non-academic workplaces—including an ability to articulate advanced knowledge and skills in non-academic terms.

Limited Awareness of Career Opportunities

PhD students and recent graduates require information about the realities of the current job market and common career paths outside of academia. Collecting and sharing information about career paths would help students and graduates, and could also improve employer and public understanding of the value PhDs can bring to a wide range of careers.²⁹ Allum, Kent, and McCarthy note that sharing information about non-academic career paths could encourage students—who otherwise “might not persist in a program due to misaligned career goals”—to complete their PhD program by “decreasing the sense of isolation that PhD students sometimes report when considering a career beyond the academy.”³⁰

26 Tamburri, “The PhD Is in Need of Revision.”

27 Ibid.

28 See, for example, The University of British Columbia, *Graduate Degree Programs*.

29 Allum, Kent, and McCarthy, *Understanding PhD Career Pathways*, 7–8.

30 Ibid., 8.

Weak Ability to Access Job Opportunities

When it comes to applying for non-academic jobs, many PhD students “lack the necessary skills, experience, and professional networks to allow them to transition effectively out of academia into other careers.”³¹ While many PhDs have strong networks of contacts in academia, they often lack networks of professional contacts outside PSE, and may struggle to build such networks. The often isolated nature of PhD studies and the stigma that some students feel in pursuing a non-academic career can make networking especially difficult.³² PhD students may also be unsure of where to look for non-academic jobs, and the most effective methods of pursuing those jobs.

Students can benefit from connecting with former alumni in non-academic careers and mentors beyond their supervisory committee. Networking with alumni and employers can help PhD students develop a better understanding of career opportunities, as well as the skills employers are looking for.³³ Facilitating better connections between employers and PhDs may help employers to understand the skills PhDs offer and the value they can bring to their organization. Internships and co-op placements may be particularly helpful in this regard (something that is explored in the following chapter). In addition, students need information on creating resumés and cover letters for a non-academic audience that showcase their advanced skills. They also need assistance preparing for interviews, and negotiating job offers.

Skills for Non-Academic Workplaces

Many PhD students need help translating the skills they have gained in their PhD studies into language that appeals to non-academic employers. Recent PhD graduates have reported feeling simultaneously overqualified and under-experienced for non-academic jobs. Rose notes that “Although it is often argued (and is surely true) that the

31 Annan, *Research Internships and Graduate Education*.

32 Interview findings.

33 DOCENT, *Transferable Skills and Employability for Doctoral Graduates*, 27.

Some universities have developed tools to help PhD students understand the transferable skills they have gained.

academic skills in research and teaching that are acquired while the student is in a program are applicable and transferrable to other settings upon graduation, there is relatively little programming that seems to be designed to demonstrate how students can identify ‘portable’ skills sets derived from this work and present these as attributes to potential employers.”³⁴

The intellectual accomplishments and knowledge associated with the PhD do not always easily translate into the applied skills that employers are looking for. Furthermore, some PhD students are so immersed in their research that they cannot separate themselves from their thesis and view it as a product and process. While regarding the thesis as a product allows PhDs to demonstrate their subject matter expertise, the process aspect allows students to demonstrate transferable skills with applicability to many work environments.³⁵

PhDs need help connecting how their dissertation effort and teaching experience are applicable outside academia. For example, rather than listing on a resumé what they taught, PhDs would benefit from speaking of their teaching experience in terms of skills valued by employers outside academia. These skills could include mentoring, managing groups, presenting, and providing performance feedback.³⁶

Some universities have developed tools to help PhD students understand the transferable skills they have gained.³⁷ Individualized guidance for students, on transferrable skills developed through their specific area of study, would also be valuable. Experiential learning opportunities, such as internships, are particularly valuable as they give students the opportunity to apply the skills they developed in

34 Rose, *Graduate Student Professional Development*, 15.

35 Turner, “Academic Imposters and Failures.”

36 Deveau, *Reframing Doctoral Skills*.

37 See for example, Polziehn, *Skills Expected From Graduate Students*; University of Michigan, *PhD Transferable Skills*.

their PhD in a non-academic context; strengthen skills such as teamwork that may not be emphasized in their academic program; and gain relevant work experience.

Conclusion

Many PhDs face challenges transitioning to non-academic positions that allow them to fully utilize the skills developed during PhD studies. The difficult transitions are partly due to the orientation of PhD programs toward academic employment and the challenges of pursuing a non-academic career. Some faculty are unable to adequately support students interested in pursuing non-academic careers, due to their own limited work experience outside academia. In addition, too many employers fail to recognize the value of the skills developed through the course of PhD studies.

To ease the transition of PhD graduates into non-academic careers, universities can increase awareness of career options among their students and faculty; help students develop job search skills such as networking, resumé and cover letter development, and interview skills; and, assist students in translating the skills developed through PhD studies into language that appeals to non-academic employers. Universities can facilitate connections between PhD alumni in non-academic careers and students, in order to provide additional support and guidance to those wishing to pursue non-academic careers. Developing stronger links between students and non-academic employers, through networking and experiential learning, can also help ease the misperceptions that some employers have about PhDs and stimulate employer demand.

CHAPTER 5

The State of Professional Skills Development Initiatives in Canada

Chapter Summary

- Universities have implemented a wide range of graduate professional development programs to ease career transitions for PhDs. Programs most commonly take the form of voluntary supplementary initiatives, such as workshops or online courses, which are easy for students to access and require a minimal time commitment.
- Immersive initiatives, such as internships, allow students to apply and strengthen their skills and gain work experience in a non-academic environment. Immersive initiatives give employers a low-risk way to try out PhD candidates and see the value that these employees can bring to their organization. Transformative initiatives are initiatives or proposals to significantly alter PhD programs to include greater emphasis on professional development training.
- PhD students should be strongly encouraged to take part in professional development initiatives early in their programs, so that they have time to explore career paths outside academia and build a professional network.

Universities across Canada have implemented initiatives to reshape PhD studies to facilitate smoother transitions to career pathways outside academia. These initiatives range from voluntary workshops and online modules, to optional experiential education initiatives, to proposals to fully transform the structure of PhD programs.

This chapter provides an analysis of Canadian initiatives that have been introduced or proposed to better prepare PhDs for non-academic career pathways. Most universities across Canada offer some type of professional development programming that PhD students can access. As such, this chapter is not meant to be a comprehensive inventory of skills development initiatives. Rather, it categorizes and analyzes broad types of skills development programs, and highlights best practices and lessons learned. Initiatives analyzed in depth were selected for their innovative nature and to ensure applicability to a broad range of disciplines and PhD programs. Initiatives are classified into three broad categories:

- **Supplementary initiatives.** Voluntary workshops, seminars, online resources, etc., that are offered in addition to PhD programs.
- **Immersive initiatives.** Voluntary programs that allow students to undertake immersive, experiential learning opportunities, such as internships, to develop and apply skills in a non-academic environment.
- **Transformative initiatives.** Initiatives or proposals to restructure PhD programs to include integrated professional development training.

Supplementary Skills Development Initiatives

Supplementary skills development initiatives are the most common type of professional skills development programming offered to PhD students.¹ Most frequently, these initiatives take the form of in-person workshops, with supplementary online resources and activities such

¹ See Rose, *Graduate Student Professional Development* for an overview of these types of programs offered at Canadian universities.

as networking sessions. Most Canadian universities with graduate programs offer this type of initiative. Examples include Concordia University's GradProSkills; the University of British Columbia's Graduate Pathways to Success (Pathways); Memorial University's Enhanced Development of the Graduate Experience (EDGE); the University of Toronto's Graduate Professional Skills (GPS) program; and Simon Fraser University's APEX program.

Supplementary initiatives are often most effective when they are centralized under the management of a single organizational unit, such as the School of Graduate Studies; "branded"; and heavily promoted.² Giving students a certificate or notation on their transcript for participation in a professional development program may help motivate students to participate—although the quality of the programming will be a more important factor.³

Supplementary initiatives are relatively inexpensive to administer and they appeal to students.⁴ They do not require a significant time commitment on the part of the student, and students can pick and choose the skills development modules that meet their needs. Feedback from students indicates they value supplementary workshops and courses, which give them increased confidence in pursuing jobs outside of academia. Because these initiatives are generally offered by graduate studies, rather than individual academic departments, PhD students can access them discreetly, which can benefit students who are concerned their supervisor may not support their participation in professional development activities.⁵

In general, supplementary initiatives are directed at both master's and PhD students, although there may be some content specifically geared toward PhD students. While undoubtedly PhD students benefit from initiatives aimed at all graduate students, such initiatives may not fully

2 Rose, *Graduate Student Professional Development*, 16.

3 Ibid., 21.

4 Ibid., 16.

5 Interview findings.

address the unique challenges PhDs face in transitioning to careers outside academia. In particular, by themselves, such initiatives may not address challenges PhDs have translating the skills developed during their studies into language that appeals to non-academic employers, or exploring non-academic career paths. Discipline specific programming and one-on-one coaching can help address these challenges, but are more resource intensive to deliver.

Concordia University's GradProSkills

Concordia University's GradProSkills is a series of non-credit workshops offered to graduate students (at the certificate, diploma, master's, and doctoral levels) and postdoctoral fellows. Workshops are supplemented by online resources such as blog posts and tip sheets, as well as in-person networking events. GradProSkills focuses on the nine professional skills development domains highlighted in the Canadian Association for Graduate Studies (CAGS) report, *Professional Skills Development for Graduate Students*.⁶ These skills domains include things such as leadership, research management, strategic communication, digital and information intelligence, career building, and wellness and life balance.⁷

GradProSkills is coordinated by the School of Graduate Studies, which allows resources to be pooled across the university. The program has a website, as well as a "Build Your Toolkit" option that allows students to select workshops according to their desired career path and each of the nine skills domains.⁸ GradProSkills tracks student participation in workshops, and gives students a record of their activities to show employers.⁹ Twenty-five per cent of the funds for the program also support graduate students who work as interns in program.

6 Canadian Association for Graduate Studies (CAGS), *Professional Skills Development for Graduate Students*.

7 Interview findings; "Venkatesh and others, Development, Implementation, and Evaluation," 41.

8 Venkatesh and others, "Development, Implementation, and Evaluation," 41.

9 Interview findings.

Since it was launched in August 2011, over 4,000 students have participated in at least one GradProSkills workshop. The biggest users of the program are engineering students—43 per cent of whom have taken a workshop. Faculty response to the program has generally been positive. New graduate programs proposed at Concordia are increasingly integrating GradProSkills workshops into their curriculum.¹⁰

While GradProSkills has seen significant uptake among graduate students, it does face challenges. As with any university service program, it is expensive to administer, especially tracking student participation in workshops. As a general skills development program, it offers little programming tailored to specific disciplines.¹¹ PhD students may feel GradProSkills does not fully address their unique skills and professional development needs, as the program is aimed at graduate students generally. Indeed, an evaluation of student satisfaction with GradProSkills workshops found PhD students were significantly less satisfied than other students.¹² In the immediate future, the School of Graduate Studies will be working closely with the university's faculties to identify needs specific to areas of study or degree-levels that could be addressed either by GradProSkills workshops or professional development activities integrated into program curricula.¹³

MyGradSkills.ca

MyGradSkills.ca is an online skills development program launched in September 2014 by the Ontario Consortium for Graduate Professional Skills Training. The development of the website was funded by the Ontario government and Ontario universities. McMaster University led the development of the initiative. By pooling resources, universities are able to expand the number of online resources they offer students.

10 Interview findings.

11 Interview findings.

12 Venkatesh and others, "Development, Implementation, and Evaluation," 41.

13 Personal communication.

MyGradSkills.ca offers graduate students and postdoctoral scholars at universities in Ontario free access to 18 short, online courses or modules in the areas of career development, including communication, entrepreneurship, research, and teaching and learning. Courses cover topics such as converting a CV to a resumé, mental health and well-being, research management, intercultural competency, and academic and professional communication for new researchers. While many of the course modules are aimed at all graduate students, some modules address the specific needs of PhD students, such as a module on diverse career paths for PhDs.

One of the benefits of online modules is that they allow students to access professional development resources according to their own schedule. Graduate students—and PhD students in particular—often juggle numerous work and family obligations. In addition, field work can take them away from campus for an extended period of time. These competing responsibilities can make it challenging for PhD students to attend on-campus workshops, especially when they are often only offered once or twice a year. Unlike in-person workshops, which have limited capacity, online modules can accommodate much larger numbers of students.¹⁴

However, online modules are very short, and lack an interactive component. While online modules do not allow PhD students to receive personalized coaching or feedback, they can be a helpful complement to in-person career resources. Some Ontario universities are structuring their in-person professional development workshops to build on the material covered in MyGradSkills.ca modules. Doing so allows in-person workshops to cover more material, because they can assume students have already gained some knowledge of the subject matter through an online module. In-person workshops allow students to ask questions and receive personalized advice that they don't receive through online

14 Interview findings.

Immersive initiatives allow students to better understand how the skills developed during PhD studies apply outside academia.

modules.¹⁵ As MyGradSkills.ca has only been operational for a very short period of time, more research is needed on the effectiveness of this approach.

Since its launch, MyGradSkills.ca has received positive feedback from students and faculty. Some graduate courses and certificates are now including the online modules in their requirements. Access to graduate students from universities outside Ontario is being expanded on a subscription basis.¹⁶ In the future, there are plans to add further content to the website, including additional modules, modules translated into different languages, a badge system for students that complete “sets” of modules, and links to other free online resources. There are also plans to create a virtual career corner on the website, where events and workshops can be live-streamed and archived for later viewing.¹⁷

Immersive Initiatives

Immersive initiatives provide an experiential learning experience where students apply the skills developed in their PhD studies to a non-academic workplace. They typically take the form of paid, short-term work arrangements or research internships. Such initiatives are generally not formally integrated into PhD programs, but run as a complementary component.

Immersive initiatives allow students to better understand how the skills developed during PhD studies apply outside academia. Generally, before students embark on a job placement, they receive professional development training on topics such as resumé writing, job interviews, and networking. PhD students who take part in non-academic job

15 McMaster University, *Charting Your Course With GPS*; MyGradSkills.ca, *Courses*; Samson, “Online Tool Aims to Help Graduate Students.”

16 Interview findings.

17 Interview findings.

placements have the opportunity to strengthen skills that may not be emphasized in their PhD program, such as teamwork.¹⁸ Students build their professional networks and gain mentors outside of academia.

Experiential learning arrangements allow employers a low-cost or low-risk way of employing a PhD student to see the value they can offer to their organization, including the ability to perform and manage research. This has the benefit not only of giving PhD students a chance to impress, but also helps shift employers' misperceptions about what PhDs can do and how they behave in non-academic environments. With regard to R&D and innovation, experiential learning arrangements help build connections between academia and industry, and give academics a better sense of the challenges and opportunities that businesses face in implementing and commercializing innovations.¹⁹

Some PhD students may be reluctant to participate in experiential initiatives because they do not wish to lengthen the time it takes to complete their degree, or are focused on attaining an academic position after graduation. In some disciplines, where career paths outside academia are not widely acknowledged, students may feel that participation in an experiential initiative marks them as less committed to the academic track. Experiential learning programs can overcome these challenges by emphasizing to students that the skills demonstrated through work placements (e.g., time management, project management and budgeting, teamwork) are also desirable for academic positions.²⁰ Experiential learning opportunities are more resource-intensive to deliver than workshops and online modules, and it may be difficult to establish enough quality internships and work placements to widely expand such programming.

18 Interview findings.

19 Annan, *Research Internships and Graduate Education*.

20 Interview findings.

The Mitacs-Accelerate Program

Mitacs is a national, not-for-profit organization that designs and delivers research programs for graduate students across Canada. Mitacs works with universities, companies, and the federal and provincial governments to help fuel innovation across Canada. The Mitacs-Accelerate program is Canada's largest provider of internships for graduate students.²¹ Through Mitacs, graduate students and postdoctoral fellows are partnered with industry to complete research projects that are supervised by university faculty. Mitacs' internship program began in 2003 as an initiative for math PhDs. In 2007, the program was expanded to include all disciplines. Sixty Canadian universities participate in Mitacs, which receives funding from the federal and provincial governments.

The cost for employers to participate in Mitacs ranges from \$15,000 for one intern for four months to multi-million dollar projects that involve several interns over a longer period of time. Mitacs has 30 business development officers based at universities across Canada who facilitate matches between the research needs of industry and students' research areas. In the 2013–14 fiscal year, Mitacs supported 2,240 internships. While interns came from all disciplines, most participants were from engineering, life sciences, and computer sciences.²²

In a recent survey of industry participants in the internship program, over 95 per cent of respondents said the program was successful in meeting their corporate needs; 88 per cent indicated they would participate again; and 92 per cent said they would recommend it to other organizations.²³ The Mitacs-Accelerate program creates long-term career opportunities for PhDs. Of industry participants surveyed, 30 per cent hired at least one of their interns upon graduation.²⁴ A survey of former

21 In addition to the Accelerate program, Mitacs also offers the Step program that provides professional development workshops for graduate students and postdoctoral researchers at universities across Canada. Workshops cover topics such as presentation skills, scientific and technical writing skills, networking, entrepreneurial thinking, and project management. See Mitacs, *Step*.

22 Mitacs, *Annual Report for Industry Canada*, 7–9.

23 Mitacs, *Mitacs Accelerate Outcomes*, 6.

24 *Ibid.*, 8.

Mitacs interns found that 46 per cent currently working in the private sector were hired by the company with whom they completed their internship.²⁵ Most former participants indicated that the completion of their internship made them feel more employable due to the professional experience and expanded professional network they gained. More than 85 per cent of former participants indicated their internship led to significant improvement in their critical and creative thinking, competence in research development and design, and ability to address private sector problems.²⁶

The UBC English Department's PhD Co-op Program

The UBC English Department, in cooperation with the Arts Co-op office, introduced a co-operative education program for PhD students as a pilot in the 2013–14 academic year. The program aims to give students a bridge into non-academic careers.²⁷ The co-op program is aimed at PhD students entering their second or third year of studies, and who have achieved candidacy. Students who participate in the program complete three four-month (sometimes eight-month) full-time, paid, work placements.²⁸ Prior to completing their work placements, students receive career training on topics such as how to turn their CV into a resumé, and attend talks with employers on the skills desired in new hires. Co-op placements for students have included a project advisor for the UBC Faculty of Graduate Studies, and a writer in residence at a local cultural organization.

To date, only a small number of students have participated in the program. However, those who have participated have gained increased confidence from the realization they have marketable skills and numerous career paths open to them. Research on undergraduate co-op students has found that upon returning to school, students get higher

25 Mitacs, *Mitacs Longitudinal Survey of Former Program Participants*.

26 Mitacs, *Study of Mitacs Program Outcomes*.

27 Interview findings.

28 Interview findings; UBC Arts Co-op Program, *English PhD Co-op Program Pilot*.

PhD students at UBC are well-funded through tuition awards, scholarships, and teaching assistant positions. Co-op wages need to be competitive with graduate students' funding packages.

marks, are more motivated, and meet deadlines. The English department has heard similar feedback from PhD co-op participants. Employers who have hired PhD students have noted that compared with undergraduates, they are more mature, require far less training and oversight, and have extremely strong writing skills. UBC is expanding the PhD co-op program to other humanities departments in the 2015–16 school year.²⁹

Cost is one challenge for the program. Co-op programs at UBC operate on a cost-recovery basis. Because of the small number of students participating in the PhD co-op, it is relatively expensive for the co-op office to administer. Furthermore, PhD students at UBC do not pay tuition, and are not inclined to pay for additional programming such as co-op. Currently, the dean of arts and the provost's office are covering the cost of the co-op program for students; however, this may become an issue as the program expands.³⁰

The wages that employers are expected to pay PhD students is also a challenge. PhD students at UBC are well-funded through tuition awards, scholarships, and teaching assistant positions. Co-op wages need to be competitive with graduate students' funding packages. Positions must pay PhD students a minimum of \$25 an hour, which can be challenging for some employers, such as non-profit organizations. Students do not receive other program funding while on co-op work terms and, during this time, their program funding is paused. While the co-op program is designed to alternate time spent on academic work with work terms, the varied experiences and changing life circumstances of PhD students mean that program administrators must be flexible about how students complete their work terms.³¹

29 Interview findings.

30 Interview findings.

31 Interview findings.

Transformative Initiatives

In light of the difficult career transitions that many PhD graduates face, a number of initiatives have been proposed to fundamentally transform PhD programs in Canada. These initiatives aim to change the “academic disposition” emphasized in PhD programs in favour of greater engagement outside academia.

For example, Porter and Phelps propose integrating “learning relevant to scholarship” into non-academic settings, including “coursework relevant to these contexts, internships in alternative settings, applied or externally engaged volunteer experiences, consulting or related activities relevant to the discipline, and embedding research undertaken in non-academic settings in the thesis work itself.”³² The 2013 *White Paper on the Future of the PhD in the Humanities* proposes reorienting humanities PhD programs to emphasize publicity (the ability to communicate with audiences inside and outside the academy); collaboration (in forms of teaching, research, and publication); and fabrication (learning through creative, hands-on approaches such as performance-based inquiry, online collaboration, and internships). The paper recommends replacing the dissertation with a collection of projects that can include websites, films, and long-form articles in public affairs or arts magazines, in addition to traditional forms of scholarship such as academic articles and papers.³³ The UBC Public Scholars Initiative is an example of a pilot initiative that builds on these types of proposals. (See “UBC Public Scholars Initiative.”)

32 Porter and Phelps, “Beyond Skills,” 58.

33 Yachnin and Yetter, *White Paper on the Future of the PhD*.

The UBC Public Scholars Initiative

The UBC Public Scholars Initiative was launched as a pilot program in 2015. The initiative aims to assist students in gaining experience in the environments and types of scholarship they may engage in post-graduation; allow diverse forms of scholarship to be evaluated as part of the dissertation; allow non-academic partners to appreciate the value of PhD scholarship and create career opportunities for PhD students; and, create opportunities for students to contribute to the public good through their research.³⁴ Examples of publicly engaged dissertation research may include:

- collaboration with a public sector organization to conduct research of mutual interest. A student's dissertation may include a policy paper as a chapter;
- collaboration with an arts or cultural organization in the preparation of a festival, exhibition, or publication. Material from these activities could comprise part of the dissertation;
- translation of basic research to a relevant external audience. This could include applying basic research in an industry context, or knowledge outreach to key stakeholder groups that might benefit from the research. The processes and results of these activities could make up part of the dissertation.³⁵

The Public Scholars Initiative is made up of three components: a public scholars' network that seeks to link students, faculty, and individuals outside academia in collaborative endeavours that apply research in non-academic settings; academic support for broad forms of scholarship; and funding for 50 students of up to \$10,000 to support innovative dissertation scholarship.³⁶

PhD students have responded positively to the Public Scholars Initiative. In its first intake of applications, the initiative had 98 applications from students, which involved partners across the public and private sectors.³⁷

34 The University of British Columbia, *UBC Public Scholars Initiative*.

35 Ibid.

36 The University of British Columbia, *UBC Public Scholars Initiative*.

37 Personal communication.

While proposals such as these could have far-reaching impacts on facilitating the ability of PhD graduates to pursue careers outside of PSE, their transformative nature makes them difficult to implement. Faculty resistance and academic culture are potential barriers to such initiatives. Students and their supervisory committees may be reluctant to pursue a non-traditional PhD pathway that does not result in the number of academic publications generated through a traditional PhD. Some students and faculty may fear a non-traditional PhD will not be competitive on the academic job market, or they may view such pathways as a second-tier program compared with a traditional PhD. Furthermore, faculty, who may have little or no career experience outside academia, may not be well-placed to facilitate and assess work outside academia. PhD programs will need to strengthen ties with individuals and organizations outside academia that could provide experiential learning and mentorship opportunities for students.

The U of T Department of Biochemistry's Graduate Professional Development Course

The University of Toronto's biochemistry department has taken steps to transform its PhD program with a for-credit graduate professional development (GPD) course. The department introduced the course in 2012, after it found only 15 per cent of its PhD graduates were ending up in tenure-track academic positions.³⁸

The GPD course covers topics such as communicating to non-academic audiences, effective networking, mentorship, finding the hidden job market, writing cover letters and resumés, informational interviews, and leadership. The course consists of six two-hour sessions, including networking sessions where professionals speak about their career paths.

38 Interview findings.

Students complete assignments as part of the course—such as a report on their research written for a general audience, and the creation of a cover letter and resumé for a non-academic job opportunity.³⁹

The GPD course has an optional internship component, given approval from the student's primary research supervisor. While internships are not a required component of the course, students are trained in techniques to find and propose their own internships and opportunities. The GPD director also brings together employers and students who meet their needs. Students who perform well in the course receive a high recommendation from the GPD director for potential internships. Internships vary widely in duration and number of hours—ranging from four month, full-time positions to one to two hours a week for a year or more. Although paid internships are strongly encouraged, some may be voluntary.⁴⁰

First and second year biochemistry PhD students are strongly encouraged to take the GPD course. By taking the course in first or second year, students have time to build their professional skills and network prior to graduation. Students are graded on their work in the course, which ensures coursework and assignments are taken seriously. Participation in the course is capped at 10–16 students. The course coordinator is a graduate of the biochemistry PhD program with extensive professional experience in the biotechnology industry.⁴¹ The course is funded through departmental funds.⁴²

One of the strengths of the GPD course is that it is tailored to students' disciplines and provides extensive coaching and personalized feedback. Students have been very positive in their assessment of the course. As one student stated, "I learned more skills here to better my career than

39 Interview findings; Lee and Reithmeier, "A Graduate Course in Professional Development"; Lee, Khayat, and Reithmeier, "Lessons Learned From a Grad Course"; Zhang, "Are We Prepared?"

40 Interview findings.

41 Interview findings; Lee and Reithmeier, "A Graduate Course in Professional Development."

42 Interview findings.

The most effective approaches combine general skills development workshops, classes, or online resources with some personalized feedback or coaching.

I would have in my entire graduate degree otherwise.”⁴³ PhD graduates who took the course have experienced relatively smooth and steady career progressions—they did not spend significant time unemployed after graduation.⁴⁴ Furthermore, by offering a course that equally values non-academic and academic career paths, the department provides a strong counter to notions that students who are unsuccessful in securing tenure-track jobs are failures.

In the future, the biochemistry department plans to make the GPD course mandatory for all PhD students. In 2014, the Immunology Department at the University of Toronto introduced the same GDP course with the same course coordinator. The course was made mandatory for all immunology PhD students.

Conclusion

In response to growing concerns about the challenging career transitions outside of PSE that many PhDs face upon graduation—and that fact that most PhD graduates will be making those transitions—universities across Canada are implementing a wide range of graduate professional development programs. These programs most commonly take the form of supplementary initiatives in the form of workshops or online courses, but also include experiential learning opportunities and comprehensive for-credit professional development courses.

The most effective approaches combine general skills development workshops, classes, or online resources with some personalized feedback or coaching. Workshops, classes, and online courses give graduate students the opportunity to strengthen professional development skills, while requiring little time commitment. Students can choose the workshops and courses that most appeal to them. The GPD course offered by the University of Toronto’s biochemistry department

43 See Lee and Reithmeier, “A Graduate Course in Professional Development.”

44 Interview findings.

is a particularly innovative and effective approach to professional development, as it allows students an in-depth opportunity to develop professional skills and receive personalized feedback.

PhD students benefit greatly when they have access to experiential learning opportunities, such as internships, and the benefits of participation in these initiatives should be strongly communicated to students. These initiatives allow students to gain relevant work experience and see the applicability of skills, which were developed during their studies, to non-academic settings. Significantly, experiential learning opportunities also allow employers to see the valuable contributions that PhDs can make to their organization, thereby helping to combat employer misperceptions about PhDs. Students should be strongly encouraged to take part in professional development initiatives early in their program. This would allow students time to explore alternative career paths outside academia and build a professional network.

CHAPTER 6

Learning From International Models

Chapter Summary

- Career transition challenges experienced by many Canadian PhD graduates are shared by PhD graduates in peer countries, such as the United States, United Kingdom, and Australia. In response, universities and post-secondary education systems in peer countries have introduced a wide range of professional skills development initiatives for PhD students.
- An industrial PhD is a type of PhD program where students complete an industry-focused PhD project involving collaboration between a PhD candidate, company, and university. Students build a professional network outside academia and develop skills such as project management and teamwork.
- Skills development initiatives that provide students with peer support, individualized career coaching, and mentorship opportunities, are particularly effective at helping students explore career paths outside academia.

Career transition challenges faced by many Canadian PhD graduates are shared by PhDs elsewhere, including those in the United States, Europe, and Australia. For example, in the U.S., the number of PhD graduates has been steadily increasing, while the number of tenure-track jobs falls far behind. In 1973, 55 per cent of biological sciences PhD graduates in the U.S. secured tenure-track positions within six years of completing their PhD, while in 2006 only 15 per cent of PhDs secured a tenure-track position within six years of graduation.¹ A 2010 survey of U.K. PhDs found that only 19 per cent were in research roles three and a half years after graduation.²

As in Canada, universities and PSE systems elsewhere are implementing initiatives to ease career transitions for PhD graduates. In some instances, these initiatives are well-established. Some, such as industrial PhD programs, seek to reorient PhD programs from an emphasis on training individuals for academia to an emphasis on training individuals for high-level careers in industry. Others are less transformative in nature, but offer comprehensive professional development programming for PhDs.

This chapter examines innovative approaches taken in peer countries to strengthen PhD skills for careers inside and outside academia. It identifies lessons with applicability to the design and delivery of professional skills development initiatives in Canada.

1 Nature, “The PhD Factory,” 278.

2 Grove, “Hundreds of PhD Students Chasing Every Early Career Post.”

Industrial PhD Programs

An industrial PhD consists of an industry-focused PhD project, and involves collaboration between a PhD candidate, company, and university. Typically, students divide their time between the company and the university, with both funding the cost of the program. Company experts take part in the supervision of the PhD student by providing oversight of the commercial and industrial aspects of the research.

Industrial PhD programs are increasing in popularity, particularly in Europe. France first established an industrial PhD program in 1981: since that time, over 10,000 science and engineering students have completed industrial PhDs.³ In the U.K., the Engineering and Sciences Research Council (EPSRC) runs 26 industrial doctorate centres in universities. Students pursuing their PhD at these centres combine research projects with coursework, and spend about 75 per cent of their time working directly with a company.⁴ The European Commission supports industrial PhD programs by providing funding for these students through its Marie Skłodowska-Curie Actions programme.⁵ Denmark's industrial PhD program is one of the most well-established and is examined in detail below.

Denmark's Industrial PhD Programme

Established in 1970, Denmark's industrial PhD programme aims to:

- increase the research skills of individuals working in industry;
- increase knowledge dissemination and interaction between post-secondary institutions and industry;
- facilitate the commercialization of new knowledge and research, including the development of new firms.⁶

3 Schiermeier, "Outside the Box," 558.

4 Engineering and Physical Sciences Research Council, *Industrial Doctorate Centres*.

5 European Commission, *Initial Training Networks (ITN)—Marie Curie Actions*.

6 Advisory Council for Science, Technology and Innovation, *The Role of PhDs in the Smart Economy*, 55; The Danish Agency for Science, Technology and Innovation, *The Effect of the Industrial PhD Programme*, 8.

In 2010,
approximately
7 per cent of
PhD students
in Denmark
were enrolled in
industrial PhDs.

Industrial PhD students divide their time equally between the company and university, devoting all their time to their research project and education. The student cannot work on other projects at the company. The length of the project is about three years—the typical length of PhD studies in Denmark.

Projects are co-supervised by the university and industry. The individual supervising the research project for the company must have general experience with the project subject, extensive knowledge of the business sector, and a minimum of a bachelor's degree.⁷ Prospective students must find a company to agree on a project before they are enrolled in the PhD program. Companies generally own the intellectual property associated with the project.⁸

The industrial PhD program aims to recruit the highest calibre of graduate students. In 2010, approximately 7 per cent of PhD students in Denmark were enrolled in industrial PhDs, predominately in the STEM fields. In 2010, 676 industrial PhDs graduated in Denmark. Of those, 54 per cent were in the technical sciences; 19 per cent in medical sciences; 12 per cent in the natural sciences; 7 per cent in agricultural and veterinary sciences; 7 per cent in the social sciences; and 1 per cent in the humanities.⁹

Industrial PhD projects are funded by the Danish Agency for Science, Technology and Innovation (DASTI) and the company where the student completes their project. The company pays the student a salary, and then receives a subsidy from DATSI to cover 30–50 per cent of the salary. The company may also receive additional subsidies to cover other expenses for the industrial PhD student. DATSI reimburses up

7 Innovation Fund Denmark, *Guidelines for Industrial PhD*.

8 Schiermeier, "Outside the Box."

9 The Danish Agency for Science, Technology and Innovation, *The Effect of the Industrial PhD Programme*, 15.

to 50 per cent of a university's costs associated with an industrial PhD student, making these students less expensive than traditional PhD students for universities.¹⁰

Benefits of Industrial PhD Programs

Industrial PhD students build a network of contacts in both academia and industry, and gain insight into careers outside academia.¹¹ They develop strong collaboration and project management skills, including an understanding of budget restrictions in industry research. Compared with traditional PhD graduates, industrial PhDs generally have a strong awareness of patenting and intellectual property law, greater experience navigating legal and regulatory frameworks, and an understanding of the commercialization process. Industrial PhD graduates are also uniquely qualified to foster ties between universities and industry.¹²

A study of industrial PhD programs in Europe interviewed companies that had hosted industrial PhD candidates and found that out of 31 companies, 19 offered employment to their industrial PhD candidate after the completion of their degree.¹³ In Denmark, 78 per cent of industrial PhD graduates find employment in industry, and one-third are hired by the company where they completed their research project.¹⁴ Industrial PhDs are more likely than conventional PhDs to be employed in the top levels of their organization's hierarchy, and in positions requiring high-level specialist knowledge.¹⁵

10 Advisory Council for Science, Technology and Innovation, *The Role of PhDs in the Smart Economy*, 55; The Danish Agency for Science, Technology and Innovation, *The Effect of the Industrial PhD Programme*, 9.

11 Borrell-Damian, *Collaborative Doctoral Education*, 35.

12 Advisory Council for Science, Technology and Innovation, *The Role of PhDs in the Smart Economy*, 56, 60; Borrell-Damian, *Collaborative Doctoral Education*, 73; The Danish Agency for Science, Technology and Innovation, *The Effect of the Industrial PhD Programme*, 20.

13 Borrell-Damian, *Collaborative Doctoral Education*, 63.

14 Advisory Council for Science, Technology and Innovation, *The Role of PhDs in the Smart Economy*, 56, 60; The Danish Agency for Science, Technology and Innovation, *The Effect of the Industrial PhD Programme*, 20.

15 OECD, *Transferable Skills Training for Researchers*, 102–03.

In Denmark, industrial PhD graduates have relatively high income levels. In 2010, industrial PhD graduates earned an average of 91,000 euros, substantially more (5,500 euros) than conventional PhD graduates. Industrial PhDs from the social sciences earned the highest average incomes (112,000 euros), followed by those in the humanities. However, the wage premium graduates earn is largely attributable to their higher likelihood of being employed in industry. Graduates from industrial PhD programs and conventional PhD programs earn essentially the same income when employed in the same sector.¹⁶

Companies that host industrial PhD students also see significant benefits. They gain access to cutting edge research, sophisticated instruments and facilities in universities, and potential highly qualified employees. As Arcelor Mittal stated with regards to hosting industrial PhD students, “Associated laboratories are full of interesting skills and competencies. Their scientific engines are high-performance and allow very innovative research. Collaborating with them makes access to basic research easier for Arcelor Mittal.”¹⁷ In Denmark, over 70 per cent of companies that hosted industrial PhD projects commercialized the research results.¹⁸ Companies in Denmark that hosted projects saw a significant increase in their patenting activity, compared with companies that did not host industrial PhDs. Host companies also saw higher growth in profitability and employment.¹⁹

Universities with industrial PhD programs gain a stronger understanding of the research needs of industry (including areas for interdisciplinary research), increase their ability to attract funding from industry, amplify

16 The Danish Agency for Science, Technology and Innovation, *The Effect of the Industrial PhD Programme*, 27–34; Myklebust, “Industrial PhDs Score High on Employment and Income.”

17 Borrell-Damian, *Collaborative Doctoral Education*, 37.

18 Advisory Council for Science, Technology and Innovation, *The Role of PhDs in the Smart Economy*, 56.

19 The Danish Agency for Science, Technology, and Innovation, *Analysis of the Industrial PhD Programme*.

Industrial PhD programs are dominated by the STEM disciplines, with limited opportunities for participation by students in the social sciences and humanities.

their role as an innovation hub for their local region, and enhance the employability of their PhD graduates. University researchers may gain access to new data from external partners.²⁰

Challenges of Industrial PhD Programs

The pre-established boundaries of industrial PhD projects may circumscribe students' opportunities for creativity and critical thinking, and lead to missed opportunities for breakthrough discoveries. There is also the risk that students spend too much time on non-academic research activities. In some instances, students may not develop the skills to succeed in an academic position, such as an understanding of research ethics and methods.²¹

It can also be difficult for universities and companies to establish relationships, particularly if they lack a history of collaboration. Two of the biggest challenges that universities and companies face when negotiating an industrial PhD project are publication rights and intellectual property rights.²² Joint supervision of students by industry and the university can also be challenging for all parties.²³

Industrial PhD programs are dominated by the STEM disciplines, with limited opportunities for participation by students in the social sciences and humanities. In many cases, industry–university arrangements for industrial PhD students in the humanities and social sciences are ad hoc in nature.²⁴ However, the high incomes of Danish social science industrial PhD graduates (noted above), suggests demand from industry for these graduates' skills.

20 Borrell-Damian, *Collaborative Doctoral Education*, 36.

21 Borrell-Damian, *Collaborative Doctoral Education*, 28; Schiermeier, "Outside the Box," 558.

22 Borrell-Damian, *Collaborative Doctoral Education*, 39.

23 Ibid., 29.

24 Ibid., 57–58.

Skills Development Initiatives

As is the case in Canada, universities and PSE systems elsewhere are implementing skills and professional development initiatives to improve the career transitions of PhD graduates. Three innovative approaches to skills development with applicability to the Canadian context are profiled below.

The MIND Program at the University of California, San Francisco

The University of California, San Francisco's (UCSF) MIND (Motivating INformed Decisions) program is a career exploration program for PhD students and postdoctorals. It is run by the UCSF Office of Career and Professional Development. UCSF is focused exclusively on health, and does not have any undergraduate students: as such, its career services office has extensive experience supporting graduate students.²⁵ The MIND program was created with a five-year, \$1.7 million grant from the National Institute of Health's Broadening Experiences in Scientific Training Awards, which supports training programs to ease career outcomes for biomedical PhDs. The program accepted its first cohort of 40 students in the 2014–15 school year.²⁶

The MIND program is nine months in duration and consists of two phases. During the first phase, students attend three one-day workshops where they learn skills for successful career exploration (e.g., conducting an informational interview, turning a CV into a resumé). In the second phase, students are split into peer teams of six. Peer teams meet once a month with a facilitator to discuss their progress on career exploration, and their goals for the following month. At the end of the program, students have developed a career plan.²⁷

25 Interview findings.

26 Interview findings; University of California, San Francisco, *MIND*.

27 Ibid.

The MIND program is open to postdoctoral and PhD students. Postdoctorals must be in the basic sciences, and the students must have been at UCSF for less than two years at the time of their application. PhD students must be in the basic sciences, and must have completed their qualifying exams less than 1 year prior to their application. This ensures PhD students have enough time to explore different career options and build a network before they graduate, while also addressing the concerns of some faculty that students not be distracted before the completion of their exams. Students are not required to disclose their participation in the program to their supervisory committee, although they are encouraged to do so.²⁸

The MIND program has received positive feedback from participants. Upon completion of the program, students have a clearer understanding of career options and feel more confident pursuing a non-academic career. Program coordinators use evaluation tools, such as surveys, to get student feedback throughout the duration of the program.²⁹ As the first cohort of students progressed through the program, course coordinators made some changes in response to their own observations and student feedback. In particular, course coordinators found many students had challenges connecting their personal values and circumstances with the demands of different careers.³⁰

The MIND program will expand to 64 participants in 2015–16, and to 128 participants in 2016–17. Scaling up will be a challenge for program coordinators. Each six-person peer group requires a trained facilitator. The first intake of the program was small enough that career services staff served as facilitators. In the future, the program coordinators are hoping to use students who have completed the program as

28 Ibid.

29 Interview findings.

30 Interview findings.

volunteer facilitators. They hope students will be motivated to continue as facilitators to build their teamwork and communication skills, and continue to participate in a peer group.³¹

The Graduate School of Excellence in Material Science in Mainz

The Graduate School of Excellence in Material Science in Mainz (MAINZ) is a German PhD program in materials science that combines scientific and research training with soft skills development. The program began in 2007 as part of the German Excellence Initiative, which provides funding to improve the research capacity and quality of German universities. MAINZ was founded in response to the need to provide new educational experiences for students, as only 10–15 per cent of material science PhD graduates in Germany go into academic positions.³²

In addition to discipline specific learning, PhD students in the program spend 10 per cent of their time “training for life,” where they develop soft skills such as teamwork, project management, and presentation techniques. Every 6 to 12 months, students conduct an annual training assessment with their supervisory committee, where they analyze their performance on a variety of soft skills and agree on training needed. Following the assessment, students take part in a variety of lectures and workshops to develop their soft skills.³³

Workshops range from one to two days in length and cover topics such as efficient reading, making the most of conference participation, intercultural communication, project management, creativity, and leadership and management.³⁴ Workshops are not taught by faculty,

31 Interview findings.

32 Interview findings.

33 Interview findings; Graduate School of Excellence Materials Science in Mainz, *Complementary Skills*

34 Ibid.

MAINZ has an active alumni program where graduates are encouraged to return and speak to current students about their careers, and network with current students and alumni.

but by certified trainers with expertise in the workshop topic. All courses include a method of evaluation for participants, such as a presentation or exam.³⁵

In addition to workshops, MAINZ has a career coach on staff who provides individualized support to students. The career coach also assists students with the challenges found in completing a PhD—such as self-motivation, cultural challenges, and conflicts with members of a student’s research team. Students have access to the career coach up to six months after they graduate.³⁶

Students are also strongly encouraged to participate in MAINZ’s mentoring program. Following a career consultation session, students in the last 18 months of their program are provided with a mentor related to their career goals. Mentors are typically from senior positions in industry, but students who wish to pursue an academic career are matched with a professor from another STEM discipline who is not involved in their research. Students meet with their mentor a minimum of four times.³⁷ MAINZ also has an active alumni program where graduates are encouraged to return and speak to current students about their careers, and network with current students and alumni.³⁸

Finally, MAINZ offers students the option of completing a micro-MBA concurrently with their PhD studies. The micro-MBA is offered in concert with universities that offer MBA programs. It takes 16 weekends to complete, and covers business basics such as accounting, management, and advertising. The micro-MBA makes students more attractive job applicants and helps them succeed in the private sector.³⁹

35 Interview findings.

36 Interview findings; Graduate School of Excellence Materials Science in Mainz, *Individual Coaching*.

37 Interview findings; Graduate School of Excellence Materials Science in Mainz, *MAINZ Mentoring Program*.

38 Interview findings.

39 Interview findings.

MAINZ has experienced some challenges in the implementation of its program. Some faculty were resistant to providing this type of graduate education. Program administrators stressed to faculty the need to train students for both industry and academia, as only a small number of students get an academic position. Another challenge has been ensuring that students complete realistic training assessments. Students don't always take the training assessments seriously, which limits the benefits they see from the program.⁴⁰

MAINZ saw its first cohort of students graduate in 2010. The program has found that MAINZ PhD graduates are much more satisfied with their first job than are typical PhD graduates, and tend to stay with their first employer for longer than other graduates. MAINZ has had very positive feedback from employers regarding the quality of its graduates. Faculty regularly have companies contact them to ask about hiring graduates, which did not occur before the program was established. Companies have also asked to sponsor student fellowships and alumni meetings in order to get access to MAINZ students and alumni.

Vitae

Vitae is a U.K., not-for-profit organization that focuses on professional development for PhD researchers and research staff. Vitae provides a wide range of online professional development resources for researchers. Its most widely recognized resource is the Researcher Development Framework (RDF), which identifies the skills and attributes of successful researchers. Researchers at all stages of their career can use the RDF tool to evaluate their skills strengths and deficits, plan professional development, and store evidence of success.⁴¹ In addition, the Vitae website offers career stories from established researchers inside and outside academia, with an emphasis on the skills needed for different careers; labour market information; sample CVs for academic and non-academic jobs; online question and answer sessions

40 Interview findings.

41 Vitae, *Introducing the Researcher Development Framework*.

on topics such as developing your profile inside and outside academia, and starting a business after your PhD. The website is also an online community where researchers can discuss topics related to professional development.⁴²

Just as important as the resources Vitae offers students, are the resources Vitae offers to individuals responsible for providing professional development training to researchers. Vitae provides professional development instructors/facilitators with course curriculums and resources (including workshop outlines, publications, videos, and case studies), training, and conferences. Vitae has also developed tools that institutions can use to evaluate the impact of their professional development programs. As there are typically only a small number of professional development trainers on each campus, Vitae's ability to facilitate the sharing of best practices and lessons learned is particularly valuable. The sharing of resources helps institutions stretch their professional development resources and minimizes overlap of activities across institutions. This may be particularly valuable for institutions with only a small number of PhD students.⁴³

In addition, Vitae conducts research and policy analysis on the professional development of researchers. It carries out national surveys of researchers, conducts and facilitates research on researcher development, and lobbies for the interests of researchers and the PSE sector.⁴⁴ Finally, Vitae provides consulting services in both the U.K. and internationally.

Until 2015, Vitae was funded by the Research Councils U.K. and other U.K. higher education funding bodies. In January 2015, Vitae shifted to a subscription model where universities pay a fee for students and staff to access resources. Vitae is now funded entirely by memberships and fees for its consulting services.

42 Interview findings; *Vitae, About Us*.

43 Interview findings; *Vitae, Supporting Researcher Professional Development*.

44 Interview findings.

The effectiveness of Vitae's programming is evident in its success transitioning to a membership model. Virtually every university in the U.K. is a member of Vitae, as well as institutions in Europe, Australia, South Africa, Japan, the U.S., and elsewhere. Approximately, one-third of all PhD students and postdoctorals in the U.K. visit the Vitae website.⁴⁵ In 2013, Vitae had more than 1.5 million webpage views, engaged with more than 60 local and regional staff associations in the U.K., and interacted with over 2,000 researchers through face-to-face training, workshops, conferences, and seminars.⁴⁶

Lessons Learned From International Initiatives

As is the case in Canada, recent PhD graduates in many peer countries face challenging career transitions. A wide range of initiatives have been introduced in peer countries to help ease career transitions and assist PhD students in developing the skills needed to succeed in careers inside and outside academia.

Industrial PhD programs reorient PhD studies to focus primarily on the research needs of industry. The benefits of this approach include strong employment outcomes for graduates, as well as the opportunity to illustrate the value of PhDs to industry. However, such an approach places PhD studies in academic and non-academic streams, and may not do much to help graduates who shift their focus to a career outside academia throughout the course of their studies.

In contrast, skills development initiatives, such as the MAINZ program in Germany, focus on training students to succeed in careers inside and outside academia. Students are encouraged to consider a variety of career options and assisted in developing the skills to do so. Students have access to individualized support and feedback. There is also a need to share best practices across institutions. And, comprehensive training and resources need to be provided to individuals responsible

⁴⁵ Interview findings.

⁴⁶ Vitae, *Researcher Development in a Time of Change*, 13.

INSIDE AND OUTSIDE THE ACADEMY
Valuing and Preparing PhDs for Careers

for providing professional development programming to PhD students. Given the resources required to implement professional development programming, Vitae in the U.K. is an example of how resources and best practices can be shared across post-secondary institutions.

CHAPTER 7

Recommendations

Chapter Summary

- Easing career transitions for PhD graduates will involve gaining a deeper understanding of the diverse career pathways of graduates, ensuring PhD students have the knowledge and skills to pursue both academic and non-academic career pathways, and improving the receptor capacity of employers for PhD graduates.
- A substantial minority of PhD graduates are employed in academic positions, to which efforts to ease career transitions for graduates must be sensitive. PhD programs must continue to train world-class researchers, but graduates must be able to smoothly transition to careers inside and outside academia.
- All PhD students should have access to comprehensive professional development initiatives and experiential learning opportunities. These opportunities allow students to better understand career paths outside academia, strengthen job search skills, build a professional network, and apply the skills developed during PhD studies to academic and non-academic environments.

Each year, thousands of students begin PhD studies across Canada with the goal of becoming a university professor. But in reality less than one in five PhD graduates ultimately become university professors. Instead, the majority of PhD graduates go on to a diverse range of careers in industry, government, and not-for-profit organizations.

The available evidence suggests PhDs make a wide variety of valuable organizational and societal contributions in non-academic careers. The skills developed during PhD studies make graduates well-placed to strengthen national productivity and innovation capacity; address complex societal problems; and make meaningful, lasting contributions to the arts and culture. In addition to specialized knowledge, PhDs contribute to organizations through their ability to delve deeply into complex issues, make connections across issue areas, synthesize vast amounts of complex information, communicate new research findings to diverse audiences, and apply research findings to a variety of contexts.

While most PhD graduates who go on to non-academic positions ultimately end up in rewarding careers, many face challenging transitions out of academia due to limited awareness of non-academic career paths, weak employer demand, and difficulty translating the skills gained as a PhD graduate into language that appeals to employers. The difficulty of this transition is often exacerbated for PhDs due to a perception that pursuing a career outside academia makes them less successful than their peers who secure tenure-track positions. Indeed, there is a lack of explicit acknowledgement in many academic departments that non-academic career paths for PhDs are the norm and are to be celebrated as successes along with academic careers.

Easing career transitions will involve gaining a deeper understanding of the diverse career pathways of graduates, ensuring PhDs have the knowledge and skills to pursue both academic and non-academic

The aim of PhD programs must continue to be to train world-class researchers—but researchers with the skills to thrive inside and outside academia.

pathways, and improving the receptor capacity of employers for PhD graduates. Efforts to ease career transitions for PhD graduates must be sensitive to the fact that a substantial minority of graduates do end up in academic positions, and the training of future academics is one significant function of PhD studies. The aim of PhD programs must continue to be to train world-class researchers—but researchers with the skills to thrive inside and outside academia. Eight strategies to improve career outcomes for PhDs are outlined below.

1. Collect and Distribute Information About the Full Range of PhD Career Pathways

Individual PhD programs, universities, and relevant provincial ministries should make information about the full range of PhD career pathways widely accessible. PhD programs are generally structured as an “apprenticeship” to the professoriate. Due to this emphasis on becoming an academic, few students take time during their studies to explore and pursue career options outside academia. While students should be encouraged to pursue an academic position, they must also be encouraged to explore other career options early on in their studies in the event their career aspirations change or they are unable to secure an academic job. Comprehensive information on the career paths of PhD graduates, drop-out rates, and time to program completion should be collected and distributed to current and prospective students. To better understand demand for PhD programs, universities across Canada should also gather and share data on the number of PhD applicants for individual PhD programs.

While many programs already have this information, it is often inaccessible to students. Widely distributing such information to students and faculty will help prospective students make an educated decision to enrol in a PhD program, encourage students to consider and pursue a range of career options, and combat the myth that graduates who do not secure academic jobs are less successful than those that do.

2. Conduct Additional Research on PhD Career Pathways

Provincial governments and universities should conduct additional research on PhD career pathways. More information is needed on the employment outcomes of PhD graduates, including the career progression of graduates, the sectors and types of organizations where PhDs are employed, and the earnings of PhDs. Wherever possible, data should be discipline-specific. There is also a lack of comprehensive evidence on the value that PhD graduates bring to different types of organizations—including economic, social, and arts and cultural impacts. Comparing the impact of PhDs with other education levels would be valuable. Additional research to understand the long-term impact of the end of mandatory retirement on the professoriate would also be beneficial in creating a better understanding of how career paths for PhDs may have changed.

A wide range of professional development initiatives for PhD students are being introduced in Canada and around the world. Many of these initiatives are still relatively new, and available evidence on their effectiveness is often limited to student uptake and anecdotal feedback from students and employers. Further research on the effectiveness of different types of initiatives, including impacts on the career progression of PhD students, would be useful.

3. Consider Career Outcomes Before Increasing Enrolment in PhD Programs or Introducing New Programs

Between 2001–02 and 2010–11, the number of students enrolled in PhD programs at Canadian post-secondary institutions increased by 73 per cent. Most of the graduates are following non-academic career paths. The career transition challenges they face means that some of them will see their full set of skills being underutilized. At the same time however, Canada also lags behind peer countries on the number of PhDs it produces—suggesting that, in some instances, it could benefit from additional PhD graduates.

The number of students accepted into PhD programs should continually be reviewed, based on research on career outcomes and transitions, and enrolment numbers.

While it is not possible to accurately predict labour market demand for PhD graduates, programs should consider the career outcomes and the career transitions of PhD graduates. Increases in program enrolment and the creation of new PhD programs ought to take into consideration previous career outcomes and labour market demand for graduates of that type of program. The number of students accepted into PhD programs should continually be reviewed, based on research on career outcomes and transitions, and enrolment numbers. And, student support programs should be adjusted accordingly. Enrolment in programs where graduates have had poor career outcomes or continue to face difficult transitions should only be increased where there are explicit strategies for improving career transitions.

4. Create Comprehensive Professional Development Initiatives for Students

Individual PhD programs and universities should create comprehensive professional development initiatives for students, while provincial governments and the Tri-Council organizations should contribute to the funding of such initiatives. While a primary purpose of PhD studies is to create new knowledge and train outstanding researchers, PhD programs must ensure graduates can succeed in careers both inside and outside academia. Students require information on topics such as how to explore different career paths; develop a professional network inside and outside academia; craft cover letters, CVs, and resumés for academic and non-academic jobs; acquire interview skills; negotiate job offers; and balance mental well-being and work life. This information can be provided through a combination of workshops, courses, and supplementary online resources. Students also benefit from individual career advising. Ideally, students will begin accessing professional development programming at the beginning of their studies, to ensure time to build a professional network and explore career options.

While faculty can help students pursue academic positions, most have limited experience outside academia, making it difficult for them to assist students in pursuing non-academic jobs. The delivery of professional development programming should be done by individuals

PhD alumni working in non-academic positions are excellent resources that PhD programs can draw on to help ease career transitions for PhD graduates.

with substantial experience outside academia and/or career services professionals. Professional development programming at many PSE institutions is oriented to all graduate students. While PhD students find value in this programming, there is a need for professional development programming tailored to the needs of PhD students. Programming oriented to PhD students in different disciplines, such as the professional development course offered by the biochemistry department at U of T, are particularly promising initiatives. Departments and faculty should strongly recommend that students participate in professional development initiatives. In addition to increasing participation in such initiatives, this would have the added benefit of explicitly demonstrating departmental support for PhD students pursuing both academic and non-academic careers.

5. Develop PhD Alumni Networks

PhD programs should develop alumni networks with PhD graduates in academic, as well as non-academic, careers. PhD alumni working in non-academic positions are excellent resources that PhD programs can draw on to help ease career transitions for PhD graduates. Maintaining relationships with alumni in non-academic positions and spotlighting their achievements to current students can increase awareness of the full range of career options inside and outside of PSE and combat myths about who is a successful PhD graduate. Alumni can assist current students by speaking about their career paths, using the skills developed during their PhD education, helping students build professional networks outside academia, and serving as mentors.

6. Increase Opportunities for Experiential Learning

Universities, individual PhD programs, and organizations such as Mitacs, should increase opportunities for PhD students to participate in immersive skills development opportunities, such as internships and co-operative education placements. The federal and provincial governments should provide additional funding for such initiatives, and employers should provide more opportunities for PhD students to participate in immersive initiatives.

During their studies, PhD students have ample opportunity to apply their skills in an academic environment through teaching and research opportunities. However, prior to graduation, few PhD students apply the skills they have developed in a non-academic workplace. Experiential learning opportunities, such as internships and co-operative education, allow PhD students to apply the skills they have developed, and strengthen skills such as teamwork and communicating to non-expert audiences. They also allow students an in-depth opportunity to explore a career outside academia, and increase their confidence that their skills are in demand in a wide range of workplaces. Internships and co-op placements create a relatively low-cost way for employers to “try out” PhD students, see the valuable contributions PhDs can make to their organizations, and enhance their company’s research and innovation capacity. Evidence from the Mitacs-Accelerate program suggests that employers who hire PhD interns often go on to hire PhD graduates.

Universities and PhD programs should widely promote experiential learning opportunities to PhD students from the time they begin their programs. It is important that the promotion of such initiatives underscores their value for students interested in both academic and non-academic career paths—for example, by emphasizing that the skills developed through work placements are desirable for both types of careers. Canada already has an excellent internship program in Mitacs. Mitacs should be expanded to accommodate more students. In particular, there is a need to increase internship opportunities for students in the social sciences and humanities.

7. Promote the Value of PhDs to Employers

Many Canada employers have never worked closely with a PhD and have little understanding of the value that a PhD can bring to their organization. In some cases, employers may harbour negative perceptions of PhD graduates or lack understanding of their potential to contribute to high performance. Universities, the tri-council funding agencies, and other organizations engaged in post-secondary education, should actively and widely promote the value of PhDs to a wide range of Canadian employers. Efforts to promote the value of the PhD

should focus on the wide range of skills PhDs acquire, such as high-level research skills, analytical and problem-solving skills, and project management, as well as discipline specific skills. For example, an English PhD graduate will have particularly strong written communication skills, while a biochemistry PhD will have extensive experience working in a lab environment. Efforts to promote the value of PhDs can benefit from engaging and spotlighting the efforts of PhD alumni who have succeeded in non-academic careers.

8. Facilitate the Sharing of Professional Development Resources and Best Practices Across Institutions

PSE organizations in Canada should facilitate the sharing of professional development resources for PhD students and best practices across institutions. With some notable exceptions, professional development initiatives across Canada are generally created and delivered within a single PSE institution. The creation of a forum to share innovative approaches, best practices, and lessons learned would help ensure the effectiveness of skills development initiatives. There is also a potential role for an organization to play in training individuals responsible for professional development initiatives, and developing shared resources such as workshop curricula, leaflets and guides, and videos.

Conclusion

PhD programs in Canada produce world-class researchers. Although a significant minority of PhD graduates become professors, the majority go on to pursue careers outside academia, and many face challenging career transitions in doing so. PhD graduates must be able to transition smoothly into rewarding careers that utilize the skills developed during their studies. A variety of innovative approaches have been established at Canadian post-secondary institutions with the aim of easing career transitions for PhD graduates, and there are many successes to show for these efforts. More can and should be done to improve the transition experience and move new PhDs into rewarding career paths.

Effectively easing career transitions for graduates will mean giving students the skills and professional network to pursue career options inside and outside academia, and increasing employer receptor capacity for PhDs. Strengthening essential skills and easing career transitions for PhDs will ensure that some of Canada's best and brightest minds are making valuable economic, social, and cultural contributions to the country.

Tell us how we're doing—rate this publication.

www.conferenceboard.ca/e-Library/abstract.aspx?did=7564

APPENDIX A

Bibliography

Advisory Council for Science, Technology and Innovation (Ireland). *The Role of PhDs in the Smart Economy*. Dublin: Advisory Council for Science, Technology, and Innovation, December 2009.

Allum, J.R., J.D. Kent, and M.T. McCarthy, *Understanding PhD Career Pathways for Program Improvement: A CGS Report*. Washington, DC: Council of Graduate Schools, 2014.

Annan, Rob. *Research Internships and Graduate Education: How Applied Learning Provides Valuable Professional Skills and Development for Canada's Most Highly Trained Students*. Mitacs, Inc. and Canadian Association for Graduate Studies, October 2012.

Anonymous. "There is a Culture of Acceptance Around Mental Health Issues in Academia." *The Guardian*, March 1, 2014.
<http://www.theguardian.com/higher-education-network/blog/2014/mar/01/mental-health-issue-phd-research-university> (accessed May 20, 2015).

Arnold, Carrie. "Overqualified or Underqualified?" *Science*, October 14, 2014. http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2014_10_14/caredit.a1400253 (accessed August 13, 2015).

Arnold, Hillary, and Carrie Smith. *Students Weigh In: National Analysis of Results From the 2013 Canadian Graduate and Professional Student Survey*. Toronto: Higher Education Quality Council of Ontario, 2015.

—. *Students Weigh In: CGPSS 2013—Supplementary Figures and Tables*. Toronto: Higher Education Quality Council of Ontario, 2015.

Arts and Humanities Research Council (U.K.). *Mapping Career Destinations: Dr. Lydia Syson*. December 3, 2013. <http://www.ahrc.ac.uk/research/casestudies/mcdlydiasyson/> (accessed March 17, 2015).

—. *Mapping Career Destinations: Dr. Melinda Haunton*. November 12, 2013. <http://www.ahrc.ac.uk/research/casestudies/mcdmelindahaunton/> (accessed March 17, 2015).

—. *Mapping Career Destinations: Dr. Andy Wigley*. May 29, 2013. <http://www.ahrc.ac.uk/research/casestudies/mcdandywigley/> (accessed March 17, 2015).

—. *Mapping Career Destinations Dr. Catherine Horwood*. www.ahrc.ac.uk/research/casestudies/mcdcatherinehorwood/.

Association of Universities and Colleges of Canada. *Trends in Higher Education: Volume 1—Enrolment*. Ottawa: AUCC, 2011.

Auriol, L. *Careers of Doctorate Holders: Employment and Mobility Patterns*. Paris: OECD, 2010.

Benderly, B. "Rethinking the PhD" *Science*, September 7, 2012. http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2012_09_07/caredit.a1200101 (accessed May 15, 2015).

Berkeley Graduate Division. *Berkeley Graduate Student Profile*. UC Berkeley, 2015. <http://grad.berkeley.edu/admissions/rankings-stats/> (accessed July 7, 2015).

Bloom, Michael, and Michael Grant. *Brain Gain: The Economic Benefits of Recognizing Learning and Learning Credentials in Canada*. Ottawa: The Conference Board of Canada, November 2001.

Bogle, David. *Good Practice Elements in Doctoral Training*. League of European Research Universities, 2013. http://www.ub.edu/escola_doctorat/sites/default/files/internacionalitzacio/LERU_good_practice_doctoral_training_final.pdf (accessed May 21, 2015).

Boothe, Paul, and Richard Roy. "Business Sector Productivity in Canada: What Do We Know?" *International Productivity Monitor*, no. 16 (Spring 2008).

Borrell-Damian, Lidia. *Collaborative Doctoral Education: University–Industry Partnerships for Enhancing Knowledge Exchange*. Brussels: European University Association, 2009.

Bouchard, Frédéric. "How to Train Students to Find Post-PhD Opportunities." *Presentation at the Canadian Association for Graduate Studies 52nd Annual Conference*. Held at St. John's, NL, October 28, 2014.

British Academy. *Past, Present, and Future: The Public Value of the Humanities and Social Sciences*. 2010. <http://www.britac.ac.uk/news/bulletin/BAPPF.pdf> (accessed March 17, 2015).

Canadian Association for Graduate Studies (CAGS). *Professional Skills Development for Graduate Students*. 2008. <http://www.cags.ca/documents/publications/working/Prof%20Skills%20Dev%20for%20Grad%20Stud%20%20Final%2008%2011%2005.pdf>.

Canadian Association of University Teachers. *CAUT Almanac of Post-Secondary Education in Canada*. Ottawa: CAUT, 2007.

—. *CAUT Almanac of Post-Secondary Education in Canada, 2013–2014*. Ottawa: CAUT, 2013.

Canadian War Museum, *About Us: Staff Directory*. 2015. www.warmuseum.ca/about-us/contact-us/staff-directory/.

Casey, Bernard H. *UK: The Economic Contribution of PhDs*. University World News, August 16, 2009. www.universityworldnews.com/article.php?story=20090813164525358.

Council of Graduate Schools. *Banff Principles on Graduate Education*. 2007. www.cgsnet.org/ckfinder/userfiles/files/mtg_BanffPrinciples.pdf (accessed May 13, 2015).

Council of Graduate Schools and Educational Testing Service.
Pathways Through Graduate School and Into Careers. Report from the Commission on Pathways Through Graduate School and Into Careers. Princeton, NJ: Educational Testing Service, 2012.

Cruz-Castro, L., and Sanz-Menéndez, L. “The Employment of PhDs in Firms: Trajectories, Mobility and Innovation.” *Research Evaluation* 14, no. 1 (2005): 57–69.

DeGrande, Hannelore, and others. “The Skills Mismatch: What Doctoral Candidates and Employers Consider Important.” *ECOOM Briefs: Centre for R&D Monitoring*, no. 4 (August 31, 2011).

Desjardins, Louise, and Darren King. *Expectations and Labour Market Outcomes of Doctoral Graduates From Canadian Universities*. Ottawa: Statistics Canada, January 2011.

Deveau, Danielle J. *Reframing Doctoral Skills: Articulating Academic Experience for the Non-Academic Workplace*. April 26, 2013.

<http://daniellejdeveau.ca/blog/wp-content/uploads/2013/04/reframing-doctoral-skills-for-the-private-sector.pdf> (accessed March 26, 2015).

DOCENT (Doctors in Enterprise). *Transferable Skills and Employability for Doctoral Graduates: Survey of the Current Landscape*. Brussels: European Commission Lifelong Learning Program, June 2010.

Economic and Social Research Council. *Study of the Contribution of Social Scientists to Government Policy and Practice*. October 2012.
www.esrc.ac.uk/files/research/evaluation-and-impact/study-of-the-contribution-of-social-scientists-to-government-policy-and-practice/.

Edge, Jessica, and Douglas Watt. *Business Leaders’ Perspectives: Canada’s Competitiveness and Innovation Doldrums*. Ottawa: The Conference Board of Canada, September 2013.

Employment and Social Development Canada. *COPS: University Professors and Assistants* <http://occupations.esdc.gc.ca/sppc-cops/occupationsummarydetail.jsp?&tid=56> (accessed May 15, 2015).

EPSRC (Engineering and Physical Sciences Research Council). *Industrial Doctorate Centres*. <https://www.epsrc.ac.uk/skills/students/centres/pre2013/idd/> (accessed May 14, 2015).

European Commission. *Initial Training Networks (ITN)–Marie Curie Actions*. April 28, 2014. http://ec.europa.eu/research/mariecurieactions/about-msca/actions/index_en.htm (accessed May 15, 2015).

Expert Panel on Federal Support to R&D. *Innovation Canada: A Call to Action*. Ottawa: Industry Canada, 2011.

Fallis, G. *Rethinking Higher Education: Participation, Research, and Differentiation*. Montréal and Kingston: Queen's Policy Studies Series, McGill-Queen's University Press, 2013.

Fullick, Melonie. "My Grief Lies All Within—PhD Students, Depression, and Attrition." *University Affairs*, December 14, 2011. www.universityaffairs.ca/opinion/speculative-diction/my-grief-lies-all-within-phd-students-depression-attrition/ (accessed May 20, 2015).

—. "PhD 'Overproduction' Is Not New and Faculty Retirements Won't Solve It." *University Affairs*, March 25, 2015. <http://www.universityaffairs.ca/opinion/speculative-diction/phd-overproduction-is-not-new-and-faculty-retirements-wont-solve-it/> (accessed June 5, 2015).

Graduate School of Excellence Materials Science in Mainz. *Complementary Skills*, May 22, 2015. http://www.mainz.uni-mainz.de/complementary_skills.php (accessed May 27, 2015).

—. *Individual Coaching*, May 22, 2015. www.mainz.uni-mainz.de/2463.php (accessed May 27, 2015).

—. *mentMAINZ Mentoring Program*, May 22, 2015. www.mainz.uni-mainz.de/Mentoring_Program.php (accessed May 27, 2015).

Group of Eight. *The Changing PhD*. Turner, Australia: The Group of Eight, March 2013. https://go8.edu.au/sites/default/files/docs/the-changing-phd_final.pdf (accessed March 13, 2015).

Grove, Jack. "Hundreds of PhD Students Chasing Every Early Career Post." *Times Higher Education*, November 6, 2014. www.timeshighereducation.co.uk/news/hundreds-of-phd-students-chasing-every-early-career-post/2016799.article (accessed May 14, 2015).

Hall, Colin. *Learning and Development Outlook 2014: Strong Learning Organizations, Strong Leadership*. Ottawa: The Conference Board of Canada, February 2014.

Innovation Fund Denmark. *Guidelines for Industrial PhD*, March 9, 2015. http://innovationsfonden.dk/sites/default/files/guidelines_for_industrial_phd_09.03.2015.pdf (accessed May 15, 2015).

Institute for the Public Life of Arts and Ideas. *White Paper on the Future of the PhD in the Humanities*. Montréal: McGill University, December 2013.

Johnson, Steve, and Gareth Williams. *Evaluating the Impact of Social Scientists*. Swindon: Economic and Social Research Council (U.K.), November 2011.

Juhlin, Mariell, Puay Tang, and Jordi Molas-Gallart. *Study of the Contribution of Social Scientists to Government Policy and Practice*. Swindon: Economic and Social Research Council (U.K.), October 2012.

Kajitani, Megan Pincus, and Rebecca A. Bryant. "A PhD and a Failure." *The Chronicle of Higher Education*, March 24, 2005. <http://chronicle.com/article/A-PhDa-Failure/44884/> (accessed March 24, 2015).

Lee, Nana, and others. "Training the Trainers: The Importance of Mentorship in Graduate Education." *University Affairs*, May 14, 2015. www.universityaffairs.ca/career-advice/career-advice-article/training-the-trainers/ (accessed July 20, 2015).

Lee, Nana, Zayna Khayat, and Reinhart Reithmeier. "Lessons Learned from a Grad Course on Professional Development." *University Affairs*, January 14, 2015.

Lee, Nana and Reinhart Reithmeier. "A Graduate Course in Professional Development." *Science Careers*, October 1, 2013.

Maldonado, Vicky, Richard Wiggers, and Christine Arnold. *So You Want to Earn a PhD? The Attraction, Realities, and Outcomes of Pursuing a Doctorate*. Toronto: Higher Education Council of Ontario (HEQCO), April 30, 2013.

McMaster University. *Charting Your Course with GPS*. September 8, 2014. graduate.mcmaster.ca/graduate-students/graduate-student-life/professional/mygradskills-ca.html (March 30, 2015).

Mitacs. *Annual Report for Industry Canada, 2013–14*. Mitacs, July 31, 2014. http://www.mitacs.ca/sites/default/files/uploads/page/industry_canada_annual_report_2013_-_2014.pdf (accessed March 31, 2015).

—. *Mitacs Accelerate Outcomes: Industry Partner Survey*. Mitacs, January 2015. https://www.mitacs.ca/sites/default/files/pdf/accelerate_partner_report.pdf (accessed March 31, 2015).

—. *Mitacs Longitudinal Survey of Former Program Participants*. Mitacs, April 23, 2015. https://www.mitacs.ca/sites/default/files/mitacs_accelerate_impact_on_former_interns2014.pdf (accessed March 31, 2015).

—. *Study of Mitacs Program Outcomes Reveals Significant Skills Development, Job Creation, and Retention of Highly Qualified Personnel in Canada*. Mitacs, April 23, 2014. <https://www.mitacs.ca/en/newsroom/news-release/study-mitacs-program-outcomes-reveals-significant-skills-development-job> (accessed March 31, 2015).

—. *Step*. Mitacs, 2015. <https://www.mitacs.ca/en/programs/step> (accessed June 20, 2015).

Mitchell, J., and others. *The 2013 Canadian Postdoc Survey: Painting a Picture of Canadian Postdoctoral Scholars*. Canadian Association of Postdoctoral Scholars, and Mitacs, 2013.

MLA Task Force on Doctoral Study in Modern Language and Literature. *Report of the MLA Task Force on Doctoral Study in Modern Language and Literature*. New York, NY: Modern Language Association of America, May 2014.

Moussaly-Sergie, Karim, and Francois Vaillancourt. *Extra Earning Power: The Financial Returns to University Education in Canada*. Toronto: C.D. Howe Institute, May 2009.

Munro, D. *Running on Empty: Canada's Persistent Business R&D Weakness*. Ottawa: The Conference Board of Canada, 2015.
http://www.conferenceboard.ca/commentaries/technologyinnovation/default/15-05-29/running_on_empty_canada_s_persistent_business_r_d_weakness.aspx.

MyGradSkills.ca. *Courses*. <https://www.mygradskills.ca/mycourses.html> (accessed March 30, 2015).

Myklebust, Jan Petter. "Industrial PhDs Score High on Employment and Income." *University World News*, August 31, 2013.
www.universityworldnews.com/article.php?story=20130830152534630 (accessed May 14, 2015).

Nature. "The PhD Factory." *Nature* 472, (April 21, 2011): 276–79.

OECD. *Transferable Skills Training for Researchers: Supporting Career Development and Research*. Geneva: OECD Publishing, 2012.

Osborne, Bethany J., and others. "Preparing Graduate Students for a Challenging World of Work: Introduction From the Special Issue Editors." *Canadian Journal of Higher Education* 44, no. 3 (2014): i–ix.

Pedersen, H. "New Doctoral Graduates in the Knowledge Economy: Trends and Key Issues." *Journal of Higher Education Policy and Management* 36, no. 6 (2014).

Polk, Jennifer. "A Ph.D.'s Path to Entrepreneurship." *Vitae*, February 12, 2014. <https://chroniclevitae.com/news/331-a-ph-d-s-path-to-entrepreneurship> (accessed March 13, 2015).

—. “Transition Q&A: Michael Ryan Hunsaker.” *University Affairs*, January 27, 2015. www.universityaffairs.ca/career-advice/from-phd-to-life/transition-q-michael-ryan-hunsaker/ (accessed March 13, 2015).

Polziehn, Renee. *Skills Expected From Graduate Students in Search of Employment in Academic and Non-Academic Settings*. Edmonton: Faculty of Graduate Studies and Research, University of Alberta, January 2011.

Porter, Susan D., and Jennifer M. Phelps. “Beyond Skills: An Integrative Approach to Doctoral Student Preparation for Diverse Skills.” *Canadian Journal of Higher Education* 44, no. 3 (2014).

Queen’s University School of Graduate Studies. *Survey on Doctoral Completion Times: Final Report*. May 2013. <http://www.queensu.ca/sgs/sites/webpublish.queensu.ca.sgswww/files/files/Faculty-degree%20completion/TTC%20Survey%20Final%20report.pdf> (accessed July 14, 2015).

Raddon, Arwen, and Johnny Sung. *The Career Choices and Impact of PhD Graduates in the UK: A Synthesis Review*. Report prepared for the Economic and Social Research Council (ESRC) “Science in Society” Team, and the Research Councils U.K. (RCUK) Research Careers and Diversity Unit, January 2009.

Research Infosource Inc. *Canada’s Top 100 Corporate R&D Spenders 2014*. Toronto: Research Infosource Inc., 2014. www.researchinfosource.com/pdf/Canada_s%20Top%20100%20corporate%20R%26D%20Spenders%202014.pdf. (accessed May 15, 2015).

Rogers, Katina. *Humanities Unbound: Supporting Careers and Scholarship Beyond the Tenure Track*. Charlottesville: University of Virginia Library, Scholarly Communication Institute, August 2013. <http://libra.virginia.edu/catalog/libra-oa:3480> (accessed July 16, 2015).

Rose, Marilyn. *Graduate Student Professional Development: A Survey With Recommendations*. Prepared for The Canadian Association for Graduate Studies in conjunction with The Social Sciences and Humanities Research Council of Canada, September 2012. <http://www.cags.ca/documents/publications/working/Report%20on%20Graduate%20Student%20Professional%20Development%20-%20-%20A%20survey%20with%20recommendations%20FINAL%20Eng.OCT%202012.pdf>.

Samson, Natalie. "Online Tool Aims to Help Graduate Students Develop Their Professional Skills." *University Affairs*, September 17, 2014. www.universityaffairs.ca/news/news-article/online-tool-aims-to-help-graduate-students-develop-their-professional-skills/ (accessed March 30, 2015).

Schiermeier, Quirin. "Outside the Box." *Nature* 482 (February 23, 2012): 557–59.

Sekuler, Allison. "Welcome to MyGradSkills.ca," September 7, 2014. <https://www.mygradskills.ca/welcome-to-mygradskills-ca.html> (accessed May 13, 2015).

Sekuler, Allison, Barbara Crow, and Robert B. Annan. *Beyond Labs and Libraries: Career Pathways for Doctoral Students*. Toronto: Higher Education Quality Council of Ontario, 2013.

Statistics Canada. CANSIM table 477-0019. *Postsecondary Enrolments by Institution Type, Sex and Program Groups (Both Sexes)*. www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/educ74a-eng.htm.

—. CANSIM table 477-0020. *Postsecondary Graduates by Institution Type, Province and Sex (Both Sexes)*. www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/educ69a-eng.htm.

—. *Census of Population, 2001 and 2006*. <http://www12.statcan.gc.ca/census-recensement/2006/as-sa/97-560/table/t1-eng.cfm> (accessed May 15, 2015).

—. *2011 National Household Survey*. Statistics Canada Catalogue nos. 99-012-X2011035; 99-012-X2011037; 99-012-X2011042; and custom tables.

Stephan, P. *Wrapping It Up in a Person: The Mobility Patterns of New PhDs*. In J. Lerner and S. Stern, eds., *Innovation Policy and the Economy*, vol. 7. Cambridge: MIT Press, 2007, 71–98.

Stolarick, K. *The Changing Returns to Education in Canada and its Provinces: 1971–2006*. Toronto: Martin Prosperity Institute, 2012.

Swaminathan, Nikhil. “What Predicts Grad School Success? *gradPSYCH* 10, no. 3 (2012). www.apa.org/gradpsych/2012/09/cover-success.aspx (accessed May 20, 2015).

Tamburri, Rosanna. “The PhD Is in Need of Revision.” *University Affairs*, February 6, 2013. www.universityaffairs.ca/features/feature-article/the-phd-is-in-need-of-revision/ (accessed July 14, 2015).

The Conference Board of Canada. *Advanced Skills and Innovation: How Much Do Advanced Skills Affect Innovation?* 2011. www.conferenceboard.ca/hcp/hot-topics/innovation.aspx (accessed March 12, 2015).

—. *How Canada Performs: Labour Productivity Growth*. March 2013. www.conferenceboard.ca/hcp/details/economy/measuring-productivity-canada.aspx (accessed March 13, 2015).

—. *How Canada Performs: PhD Graduates*. June 2014. www.conferenceboard.ca/hcp/provincial/education/phd.aspx (accessed May 15, 2015).

—. *How Canada Performs: Business Enterprise R&D Spending*. April 2013. www.conferenceboard.ca/hcp/details/innovation/berd.aspx (accessed May 13, 2015).

The Danish Agency for Science, Technology and Innovation. *Analysis of the Industrial PhD Programme*. Copenhagen: The Danish Agency for Science, Technology and Innovation, 2011.

—. *The Effect of the Industrial PhD Programme on Employment and Income*. Copenhagen: The Danish Agency for Science, Technology and Innovation, December 2012.

The Economist. "The Disposable Academic: Why Doing a PhD Is Often a Waste of Time." *The Economist*, December 16, 2010. <http://www.economist.com/node/17723223> (accessed May 15, 2015).

The Expert Panel on STEM Skills for the Future. *Some Assembly Required: STEM Skills and Canada's Economic Productivity*. Ottawa: Council of the Canadian Academies, 2015.

The University of British Columbia. *Graduate Degree Programs*. <https://www.grad.ubc.ca/prospective-students/graduate-degree-programs> (accessed July 14, 2015).

—. *UBC Public Scholars Initiative*, 2015. <https://www.grad.ubc.ca/about-us/initiatives-plans-reports/ubc-public-scholars-initiative> (accessed July 20, 2015).

Turner, Jonathan. "Academic Imposters and Failures." *MyGradSkills.ca*, December 18, 2014. <https://www.mygradskills.ca/academic-imposters-and-failures.html> (accessed July 16, 2015).

Tzanakou, Charikeia. *Beyond the PhD: The Significance of Boundaries in the Early Careers of Highly Qualified Greek Scientists and Engineers*. PhD Thesis, University of Warwick, 2012.

—. *The Value of the PhD in a Knowledge-Based Economy: Beyond Financial and Career Gains*. Europe of Knowledge, 2014. <http://era.ideasoneurope.eu/2014/03/11/the-value-of-the-phd-in-a-knowledge-based-economy-beyond-financial-and-career-gains/>.

UBC Arts Co-op Program. *English PhD Co-op Program Pilot*. <http://artscoop.ubc.ca/students/how-co-op-works/phdpilot/> (accessed March 30, 2015).

University of California, San Francisco. *MIND: Motivating INformed Decisions*. <http://mind.ucsf.edu/> (accessed May 19, 2015).

University of Michigan. *PhD Transferable Skills*. <https://careercenter.umich.edu/article/phd-transferable-skills> (accessed March 26, 2015).

University of Ottawa. *Admission Scholarships*. Faculty of Graduate and Postdoctoral Studies. www.grad.uottawa.ca/default.aspx?tabid=1472 (accessed September 22, 2015).

University of Toronto. *Financing Your Graduate Education*. School of Graduate Studies. <http://www.sgs.utoronto.ca/currentstudents/Pages/Financing-Your-Graduate-Education.aspx> (accessed September 22, 2015).

Venkatesh, Vivek, and others. "Development, Implementation, and Evaluation of a Professional Skills Development Program: The Case of Concordia University's GradProSkills." *Canadian Journal of Higher Education* 44, no. 3 (2014): 39–53.

Vitae (U.K.). *Introducing the Researcher Development Framework*. 2010. <https://www.vitae.ac.uk/vitae-publications/rdf-related/introducing-the-vitae-researcher-development-framework-rdf-to-employers-2011.pdf> (accessed May 15, 2015).

—. *Researcher Career Stories*. <https://www.vitae.ac.uk/researcher-careers/researcher-career-stories> (accessed May 15, 2015).

—. *Researcher Development in a Time of Change: Vitae Achievements in 2013*. Careers Research and Advisory Centre (CRAC) Ltd., 2014. <https://www.vitae.ac.uk/vitae-publications/reports/vitae-annual-report-2013.pdf> (accessed May 20, 2015).

—. *About Us*. <https://www.vitae.ac.uk/about-us>.

—. *Supporting Research Professional Development*. <https://www.vitae.ac.uk/doing-research/leadership-development-for-principal-investigators-pis/developing-individual-researchers/supporting-researcher-professional-development>.

Vriend, Julia. "Time Limit Imposed: Graduate Students Will Have to Complete Their Degrees in Shorter Times." *The Journal*, March 15, 2013. www.queensjournal.ca/story/2013-03-15/news/time-limit-imposed/ (accessed July 14, 2015).

WANTED Analytics. *See How Data Analytics Can Transform the Way You Manage Human Capital*. 2015. <https://www.wantedanalytics.com/>.

World Economic Forum. *The Global Competitiveness Report 2014–2015*. Geneva: World Economic Forum, 2014.

Yachnin, Paul, and Leigh Yetter. *White Paper on the Future of the PhD in the Humanities*. Montréal: McGill University, December 2013.

—. "The Future of the Humanities PhD." *Policy Options*, November 2014. <http://policyoptions.irpp.org/issues/policyflix/yachnin-yetter/> (accessed March 13, 2015).

Zhang, Angela. "Are We Prepared? A Student Review of the Graduate Professional Development (GPD) Course." *Impress Magazine*, September 30, 2014.

Insights. Understanding. Impact.



e-Library.

Do you want to have access to expert thinking on the issues that really matter to you and your organization?

Our e-Library contains hundreds of Conference Board research studies in the areas of Organizational Performance, Economic Trends and Forecasts, and Public Policy.



The Conference Board
of Canada

Le Conference Board
du Canada

www.e-library.ca



About The Conference Board of Canada

We are:

- The foremost independent, not-for-profit, applied research organization in Canada.
- Objective and non-partisan. We do not lobby for specific interests.
- Funded exclusively through the fees we charge for services to the private and public sectors.
- Experts in running conferences but also at conducting, publishing, and disseminating research; helping people network; developing individual leadership skills; and building organizational capacity.
- Specialists in economic trends, as well as organizational performance and public policy issues.
- Not a government department or agency, although we are often hired to provide services for all levels of government.
- Independent from, but affiliated with, The Conference Board, Inc. of New York, which serves nearly 2,000 companies in 60 nations and has offices in Brussels and Hong Kong.

Insights. Understanding. Impact.



The Conference Board
of Canada

255 Smyth Road, Ottawa ON

K1H 8M7 Canada

Tel. 613-526-3280

Fax 613-526-4857

Inquiries 1-866-711-2262

conferenceboard.ca

