Gender Differences in the Early Career Experiences of Engineers in Canada

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Abstract

Canada has an urgent need for more engineers to support its infrastructure, advance technology, and solve increasingly complex human, economic, and environmental problems. Women have often been identified as a resource who can provide new perspectives, solutions, and innovations. While women's participation in engineering programs has increased over the last 50 years, their participation rate in the workforce has not, keeping engineering as a male-dominated occupation. Despite challenges, women graduates have entered the engineering workforce, but often they have not stayed. The purpose of this quantitative study is to explore the early career experiences of engineering graduates to identify patterns shaped by the graduates' gender. Applying feminist lenses to the most recent data on Canadian graduates available at Statistics Canada and utilizing advanced quantitative methods, we study BEng graduates from Canadian universities. This study provides a broader understanding of the phenomenon of women's underrepresentation in engineering and presents findings that can help retain more women in the occupation. Three samples of BEng graduates with over of 10,100 participants were included in this study to answer three main research questions: a) are there gender differences in the duration of job search and types of jobs these graduates obtained after graduation?; b) are there gender differences in job satisfaction among young engineers?; c) are there gender differences in the intention to look for another job once in a first engineering job? Themes and subthemes relevant to women's underrepresentation in the occupation are found to help answer these questions. Recommendations for policy and future research are discussed.

Dedication

In memory of my father.

Acknowledgement

It would be remiss not to acknowledge all the women engineers who entered and stayed in the occupation despite the large number of challenges along their career path. While the path for women into the occupation has been established, not many women take this career road. Hopefully, this research will provide some insights into how we can make women's inroads into the occupation wider.

This study is very personal to me. I grew up in a family of engineers, and I was educated as an engineer myself. I was inspired by my father's passion for the occupation, and I had hoped to be an outstanding engineer. However, my immigration to Canada upset all my professional plans, and I found myself far away from engineering. The pain of losing my professional identity as an engineer has been with me for a long time. Now, completing this work, I hope to be useful for engineers to understand their occupation better, learn more about gender differences, and take all the necessary steps that will allow an inclusive work environment for all. This study provides an example of the knowledge of the occupation written by an engineer about engineers and for engineers and all others who are interested in the occupation and women's participation in it.

This work would not be possible without the guidance, inspiration, and constant support of Dr. Catherine Mavriplis. Her own professional career as a decorated scholar and an engineer, her presence, and her involvement in the project not only inspired me but kept me going on these days when nothing seemed possible. Dr. Phyllis Rippey's invaluable feedback, guidance, and passion allowed me to convert my ideas and inspiration into the knowledge that might be used and useful for engineers in their endeavor to make the occupation diverse and inclusive. I also would like to thank Dr. Ann Denis for her enormous patience and uncountable number of edits, comments, and questions about this thesis. I thank Dr. Hugh McCague, a statistician from York

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I am thankful to my sons, Jacob and Philip, who loved me unconditionally and all the time even when I paid more attention to my dissertation than to them. I would like to thank my partner, Philip Kiameh, who was with me during all stages of the Ph.D. program and dissertation writing. His support and love kept me going to the completion of this thesis. I am blessed to have all of you in my life.

Chapter 1. Introduction

My dissertation addresses the question of gender differences in early career experiences in engineering by examining entry into the occupation, job satisfaction, and intention to look for another job for Bachelor of Engineering (BEng) graduates in Canada. Taking a feminist approach to the data analysis I argue that despite shifts from an industrial to a knowledge economy, early career experiences in engineering continue to be shaped by the gender of graduates. Using the most recent data available on Canadian university graduates, the National Graduates Survey (2013), I employed advanced statistical methods and organized my analysis in the form of three journal articles. The first empirical article uses Cox Proportional Hazard models to predict gender differences in the duration to first jobs obtained after graduation from Canadian engineering university programs. The second article uses logistic regression analysis to determine whether men and women in engineering jobs have differences in their levels of job satisfaction, and if so why. Finally, the third article, addresses a similar question to see what predicts gender differences, if any, in the likelihood that a new engineer will seek a job with another employer. Overall, I found that graduates' personal and job characteristics and their perceptions about their jobs are important predictors of their early career experiences. In particular, the results show significant gender-based differences in job search duration and job satisfaction for these graduates. While the analysis of the intent to look for another job showed no gender differences among the BEng graduates to look for a job with another employer, factors that are often associated with gender such as being married and a parent were found to be significant predictors of the BEng graduates' intention to look for another job.

These results show some positive changes in women's experiences in engineering; however, questions are raised that require further examination and analysis. This study builds on

a body of research showing persistent gender inequalities in engineering in terms of pay and career opportunities. Unlike many existing studies which focus on barriers and factors that drive women out of the occupation, this study provides insights into the young engineers' experiences who searched for a job, found a job and worked in engineering after graduation. The results of the analyses show that women are hired sooner than men and into equivalent jobs to men after graduation; they are, more than men, satisfied working in engineering jobs, putting greater emphasis on belonging to engineering rather than on pay and career opportunities; and women are as committed as men to their engineering jobs and organizations.

My work is informed by my own history as a woman with a Master's degree in mechanical engineering from the Russian Federation. When I arrived in Canada 20 years ago, I had one year of professional experience in an industrial setting. I hoped to get an engineering-related job in Canada quickly, as at the time of my immigration, Canada was experiencing a shortage of specialists in the technological sector. Many of my classmates—primarily men—were recruited and hired by Canadian companies, some while still in the Russian Federation, and after their arrival were granted permanent resident status within less than six months. I, however, despite having similar credentials and work experience, faced rejection of my applications to work for Canadian engineering employers. While many of my male former classmates were working in engineering jobs enjoying higher than average salaries and various career opportunities, I found myself working as a secretary at a non-profit organization in Toronto. Over the course of my communications with my male friends about their workplace experiences, I learned about a lack of representation of women, especially young women in Canadian engineering industry. These experiences provided the impetus for this research and led me to numerous questions, such as why were men hired but not women with the same degree and

background? Is this due to systemic barriers or individual characteristics? How are these barriers manifested and maintained? What are realistic career expectation for these women?

Women's underrepresentation in engineering has been seen as an important problem for academics, the government, and for many Canadian engineering firms for several reasons. For one, the technological sector has been recognized as a locomotive of economic success for Canadian society (Beniger, 2009). This field has been projected to need significant numbers of qualified professionals including engineers, leading to increasing recruitment and retention efforts of both male and female engineering graduates (Chesler & Chesler, 2002). Furthermore, a shortage of women contributes to limited diversity in these fields and can impede creativity, innovation, and global competitiveness (Blickenstaff, 2005). Thus, understanding the work experience of engineering graduates especially at their early career stages might inform future programs and policies that focus on women's retention in the occupation.

Historical background

Since the 1970s, many researchers have noted the transition that has occurred in advanced industrial nations from a manufacturing-based to a services-driven economy. This change often goes by the labels postindustrial or post-Fordist (Bell, 1973; Block, 1990). More recently, some researchers coined the term "knowledge economy" to describe the shift from industrial production to the production of innovations (Robison & Crenshaw, 2002). The knowledge economy is often defined as production and services based on knowledge-intensive activities that contribute to an accelerated pace of technological and scientific advance as well as equally rapid obsolescence (Powell & Snellman, 2004). The key components of a knowledge economy include a greater reliance on intellectual capabilities than on physical inputs or natural

resources, combined with efforts to integrate improvements in every stage of the production process via various technological innovations (Houghton & Sheehan, 2000).

The shift from industrial production to the production of innovations has modified ways of working and the lives of many Canadians (Fenwick, 2004). For many industrial organizations, the new economic regime has resulted in downsizing and outsourcing of their production (Sturgeon, 2002). With this shift in the labour market, the demand for highly educated workers has expanded across many occupations, especially in the technological sector which is recognized as leading economic success in the context of the knowledge economy (Krahn et al, 2010). This need for highly-educated and skilled labour has also resulted in the expansion of educational institutions across all Western countries including Canada (Stromquist & Monkman, 2014), opening educational opportunities for many previously underrepresented groups. Starting in the 2000s, various initiatives were launched to start career development as early as primary school, and women and other non-traditional groups were encouraged, attracted, and recruited to enter STEM educational programs (Burke & Mattis, 2007).

Additionally, "lean" organizations emerged after economic restructuring which offered more flexible, contract, and project-based jobs with a variety of work arrangement options (Sears, 1999). Flexible hours and working from alternative places (Sirianni & Negrey, 2000), among other options, were purportedly introduced to address a desire of a new generation of employees for a better integration of work and life (Rawlins et al, 2008). This flexibility introduced by economic restructuring also meant increasing labour market precarity for many workers and eliminated their ability to count on a life-long career with one employer (Zuo, 2004). As such, men's breadwinner role diminished (Tichenor, 2005), and dual-earner families

became a reality, necessary for survival for many in Canada and the Western world (Duxbury et al., 2007).

Economists hoped that the restructured organizations with their variety of employment options would make it possible for women to combine work and family responsibilities (Houston, 2005) while the large supply of qualified workers would lead to healthy competition and allow employers to pick the most talented and productive regardless of their gender (Brown & Tannock, 2009). These modifications in the mode of production and ways of work did lead to an increased number of women entering the workforce (Moyser, 2017) and to significant career advancement for women who were already in the labour market (Webster, 1999). In 2011, Statistics Canada reported women reaching 39% of the graduating population from STEM programs in comparison to 20% in 2001 (Dionne-Simard et al., 2016). The proportion of women graduating from engineering increased from 14% to 23% while the number of working women engineers increased from 12% to 14% in the period of 2001- 2011 (Ramirez & Kwak 2015).

However, some promises of the knowledge economy have not come to fruition. Scholars who analyzed the effect of the knowledge economy on these recent graduates' labour market outcomes noted a shortage of jobs that required university degrees (Green & McIntosh, 2007). In general, a high level of unemployment was attributed to graduates from the humanities and social sciences (Carnevale et al., 2013); however, graduates from engineering programs were not immune to long and frustrating job searches for their first job after graduation, dissatisfaction with the jobs due to the graduates' skills mismatch to their jobs, and often turnover intent (Kahn, 2010). Women's professional advancement, in particular, has also come with challenges, particularly in the struggle for women to balance their career and family responsibilities (Stone 2008). Some suggested that in the context of the knowledge economy the professional inequality

in terms of pay and career opportunities between men and women has deepened (Brown et al. , 2004). Others have shown that women, especially in medicine and science, are now better able than in the industrial era to achieve high-level positions and are often hired ahead of men with greater autonomy at work and at home (Ceci & Williams, 2011; Mann & Diprete, 2013). However, despite organizational changes and significant efforts to expand women's access to the field, engineering is one occupation that continues to be persistently male-dominated (Dionne-Simard et al., 2016; NSERC, 2010).

Engineering as an Occupation

Engineers are a critical force in advancing the technological sector of this country (Reich, 2002), making engineering one of the most prestigious occupations in Canada. In the last two decades, advocacy organizations have made significant progress in attracting women into engineering educational programs (Rosser, 2003). However, the increase in women's participation in engineering educational programs has not translated into the same degree of increase of women engineers (Hill et al. , 2010). In this predominantly male-dominated occupation, women engineers have suffered from the negative impact of the gendered oppression experienced by all women in Canadian society (Faulkner, 2009). Social scientists have been focusing on the effect of gender in analyzing the sources and consequences of oppression in the engineering profession (Cech, 2013). For example, Ferguson and Wang's (2014) study showed that women are less likely than men to enter the occupation after graduation. Hill et al. (2010) showed that women are more likely than men to quit engineering jobs in their early careers. Many existing qualitative studies provided insights into women engineers' everyday challenges at work. Women engineers often face pay inequalities (Cech, 2013), motherhood penalties

(Buchmann & McDaniel, 2016), and sexual harassment (Powell & Sang, 2015), all of which are tied to women's underrepresentation in the occupation.

Various theoretical approaches have been applied to understand women's experiences and underrepresentation in engineering; however, two distinct explanations can be found in the literature: gender and job characteristics perspectives. From a gender perspective, women are more likely than men to quit the occupation due to competing work and family commitments. Women are more often than men primary caregivers to their families. The job characteristics perspective suggests that differences in the labour market behaviors of men and women is due to differences in their jobs rather than to their genders. For instance, Acker (2006) suggests that although research can seem to show that women are opting out of the occupation to take care of their families (Stone 2008), they are actually being pushed out of occupations that fail to address the needs of women workers.

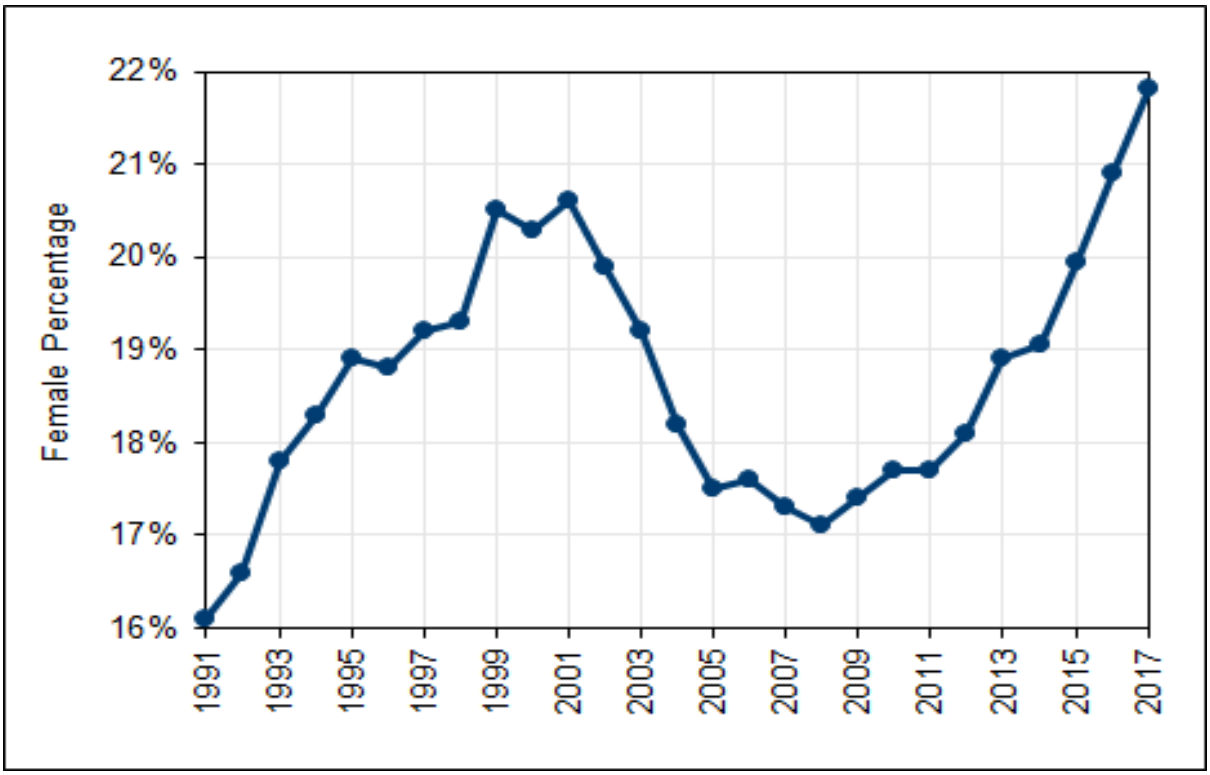
While debate continues to be strong in the recent literature to explain why women avoid or leave engineering, little is known about the experiences of women who stayed in the occupation. The sparse international literature hints that engineering as an occupation has undergone many changes in its structure and culture: women are enjoying engineering jobs (Gill et al., 2008), they feel like they belong (Ayre et al., 2013), and in some cases newly graduated women engineers get their first engineering jobs sooner than their male colleagues (Salas-Velasco, 2007). Gender differences in pay, while not eliminated, seem to become more equally balanced (Ceci & Williams, 2011). Many initiatives have been implemented to increase women's retention and career development (Rosser, 2003). Yet, Statistics Canada continues to report minimal changes in engineering demographics (Hango, 2013). The most recent research on how

women engineers enter and experience the occupation is absent from the literature and prevents our understanding of the effect of gender in the context of the knowledge economy.

In Canada, 43 universities grant BEng degrees with 42 engineering specializations (see Appendix A). According to an Engineers Canada report (2017), the undergraduate student enrolment in accredited engineering programs totaled 82,480 in 2017. This is an increase of 14.4 percent over 2013. The most popular disciplines are mechanical, civil, and electrical engineering, representing 22.1 percent, 14.1 percent, and 13.6 percent of total engineering undergraduate enrolment, respectively.

Women's enrollment in engineering programs has fluctuated (Graph 1) over the last 25 years. The percentage of women in the total undergraduate enrollment has increased steadily in terms of absolute numbers in recent years to 22 percent in 2017 (the latest year for these statistics), having started at 16 percent in 1991. However, as Graph 1 indicates, the increase from 1991 to 2001 (20.5 percent) was almost completely reversed from 2001 to 2008, when it was 17 percent. The year 2017 had the highest proportion of female enrollment in undergraduate engineering programs ever recorded by Engineers Canada (2017).

Graph 1: Female undergraduate enrollment as a percentage of total enrollment 1991-2017, full-time equivalent (Source: Engineers Canada 2017)

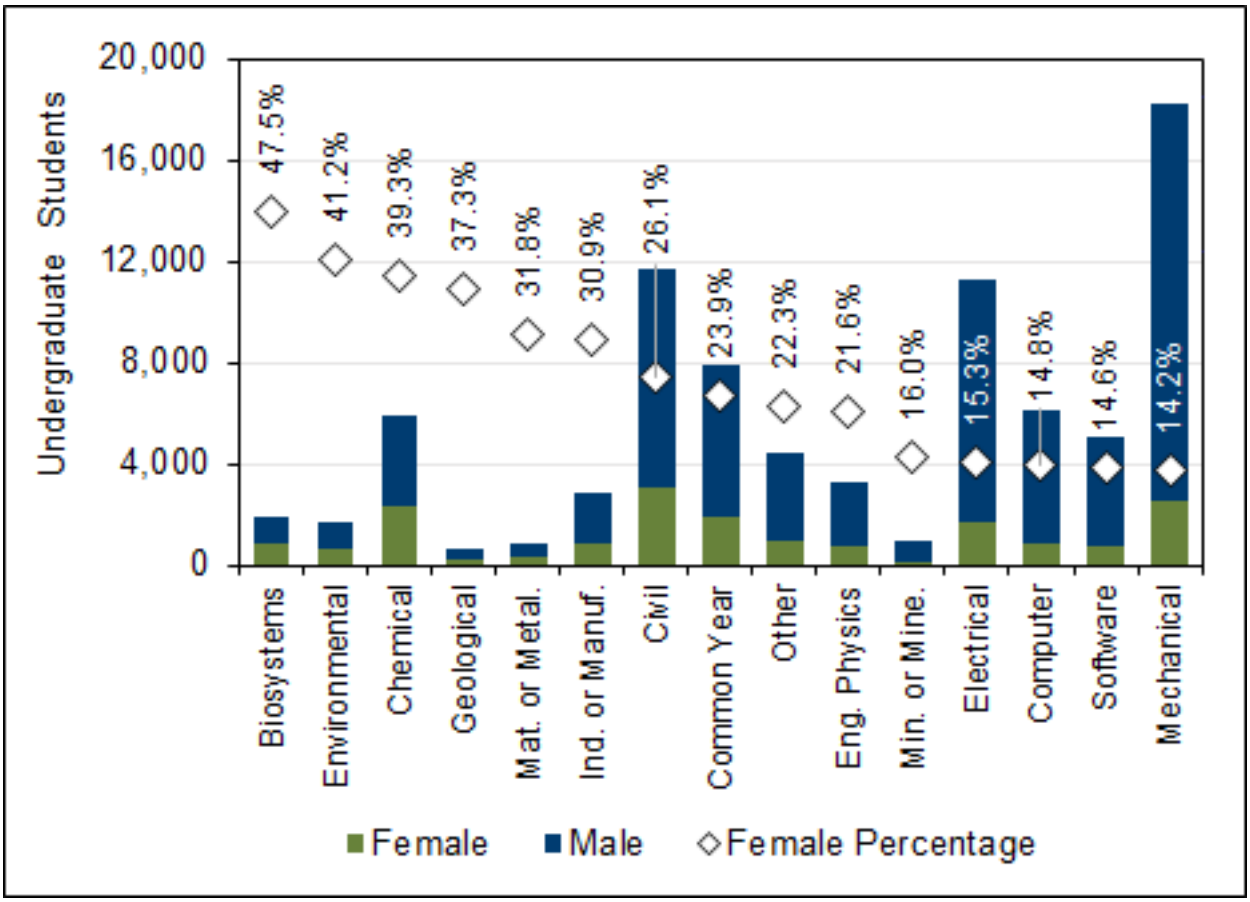


Ontario, Quebec and Alberta have the highest levels of enrollment in engineering programs for both men and women. However, in 2017, Newfoundland and Labrador had the highest percentage of female undergraduates (28.2 percent), while Saskatchewan displayed the lowest percentage of female enrolment in 2017, with only 18.5 percent of women in the undergraduate engineering student population.

As the Engineers Canada report (2017) suggests, women's total number of enrollment in engineering programs steadily increased in the past decades; however, this increase is uneven across branches of engineering. Graph 2 illustrates that while the lowest percentage of women is in mechanical engineering (14.2 percent), since this is a popular field, there are still many more women in this discipline in comparison to more specialized ones, such as biosystems engineering, where women are almost at parity (47.5 percent). Chemical engineering is usually

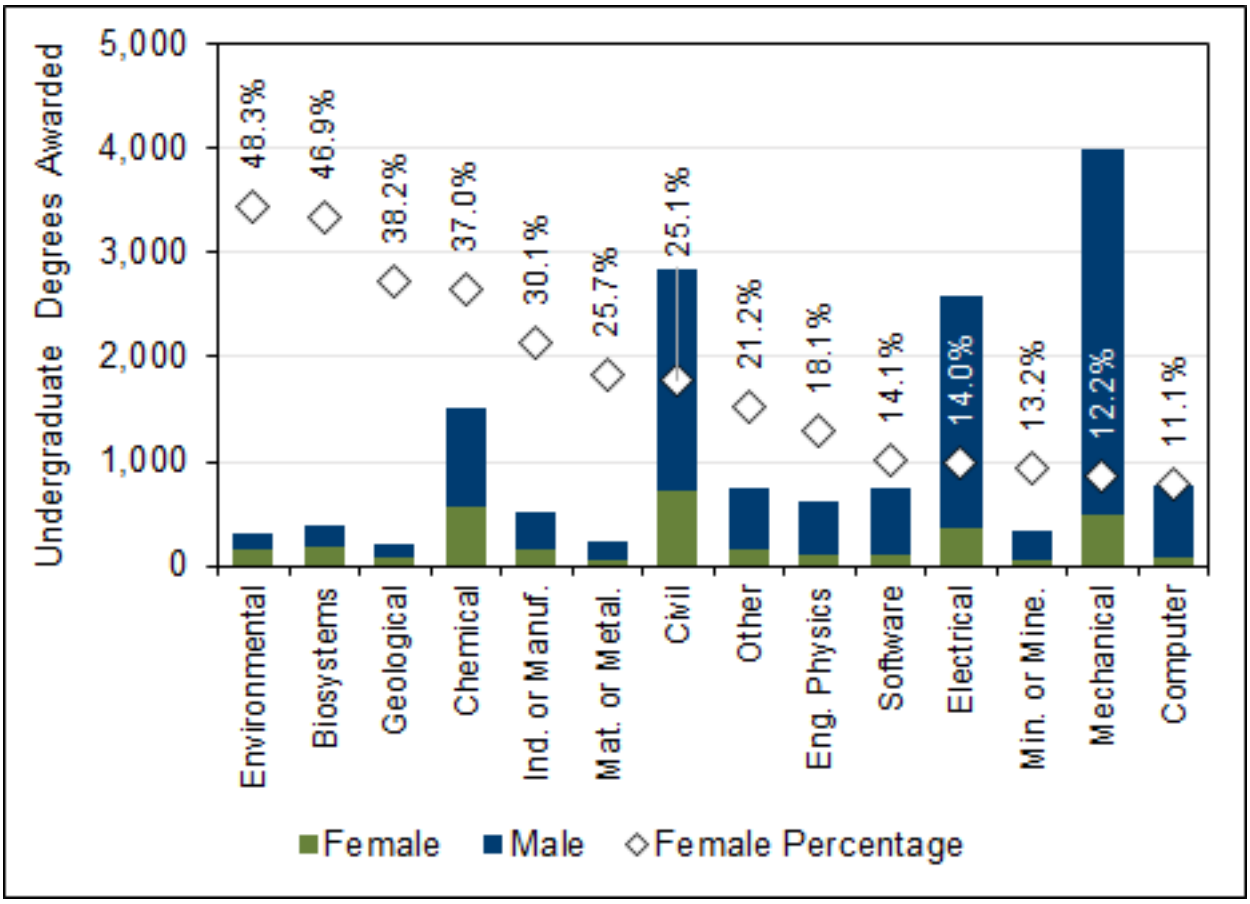
popular with women (39.3 percent) as well as civil engineering (26.1 percent) which makes up a large number of students along with mechanical.

Graph 2: Female undergraduate enrolment by discipline, 2017, full-time equivalent (Source: Engineers Canada, 2017)



The numbers of degrees awarded echo the pattern of gender segregation based on branches that are observed at enrollment (Graph. 2). Graph 3 shows that the largest number of degrees awarded to women were in environmental and biosystems engineering at 48.3 and 46.9 percent, respectively. In contrast, only 12.2 percent of women graduated from mechanical engineering and 11.1 percent from computer engineering. This gender segregation based on branches of engineering has been persistent and hard to address (Ceci & Williams, 2010; Ceci et al., 2009).

Graph 3: Undergraduate degrees awarded to female students by discipline (2017), Engineers Canada, 2017.



There are three main explanations to this segregation: differences in innate abilities and socialization between men and women; and multiplicity of factors which combined results in gender based segregation in engineering branches. The existing studies showed that differences in innate abilities for higher end mathematics and high-end performance achievements are now too small to explain any substantial portion of the gender segregation in choice of field of studies (Hyde et al., 2008; Xie & Shauman, 2003). Other studies looked at family-work conflict and found that these factors also have a very small effect on the choice of field of studies in STEM (Boulis and Jacobs, 2008; England 2010). All in all, these results perhaps suggest that innate abilities, socialization, and family obligation are unlikely to result in segregation in field of study

choice, yet studies continue to point out on persistent patterns of gender segregation and gender-based inequalities in labor market outcomes for engineering degree holders (Mann & DiPrete, 2013).Considering that men and women now have the same overall rates of labor market participation (Bilimoria and Lord, 2014) and that women now outnumber men in rates of university educational attainment (Turcotte, 2011), as well as the substantial gender integration that occurred in medicine, law, and business, explaining the persistence of gender segregation in engineering is an important research question.

This study looks at a small group of Canadian women who entered engineering programs right after high school and compares their early career experiences to similar men in order to identify the effect of gender. We applied a feminist theoretical lens to understand gender inequalities (Harding, 1986). This approach defines gender as a social understanding/ideology structure that defines what behaviors, actions, and appearances are normal for males and females (Smith, 1974). From this point of view, gender becomes a mechanism that defines men's and women's life outcomes but does not reflect inherent biological capacities. We used advanced quantitative methods on the most recent Canadian data from the National Graduates Survey 2013 (Statistics Canada, 2013) to analyze gender differences in the duration to first job, job satisfaction, and intent to look for a job somewhere else.

Further, this research is grounded in a feminist epistemology that suggests that the knowledge women produce about themselves differs from that produced by men. This feminist epistemological approach seeks to establish knowledge production from women's perspective (O'Leary, 1977), which is said to replace the "view point from nowhere" (Ramazanoglu, 1992: 113) typical of more purely positivist approaches. Proponents of this epistemological perspective often suggest that qualitative methods are the most appropriate approach to access the personal

experiences that will shape knowledge to more accurately capture women's experiences. Additionally, they reject quantitative survey methods for treating all individuals as equal units of analysis thereby perpetuating the muteness of women's voices and reflecting the patriarchal society from which the data are gathered (DuBois, 1983).

However, not all feminists reject quantitative methods in feminist research. For example, Gelsthorpe and Morris (1990) argue that quantitative methods can prove useful in producing background data and conclude that feminist researchers ought to use a multiplicity of methods to explore various phenomena. It is also important for researchers to "speak the same language" as those to whom the research will be presented (i.e. engineers). Hunt (1986) highlights the need for feminist research to produce statistics to formulate legislation, and Maynard (1994) emphasizes the role that quantitative methods have played in identifying the feminization of poverty, arguing "the *political* potential of such work should not be underestimated" (p.13, italics in original). Similarly, Reinharz (1992) points to the use of survey data in the formulation of laws and policy making.

Further, this critique of quantitative methods presumes that the researcher does not share a feminist perspective. I argue that by drawing on my own personal standpoint as a woman with a background in engineering, I am able to employ a feminist lens to the use of quantitative methods in fruitful ways to understand a broader picture of women's experiences more generally. Particularly considering that some, though not all, of my own experiences were reflected in the results of these analyses, data analysis can offer an important balance to claims drawn from situating individual points of evidence. Consequently, I argue that this approach has an important potential contribution to the development of evidence-informed policies and programs for women's greater occupational advancement.

Chapter 2. Gender Differences in the Search for a First Job by New Engineers in Canada[1]

Introduction

There is clear evidence that women are underrepresented and paid less than men in science, technology, engineering, and math (STEM) fields in general (Ferguson & Wang, 2014; Tang, 2000; Cech, 2013; Syed & Chemers, 2011; Mills et al., 2014). Of all the STEM fields, engineering has one of the lowest rates of women pursuing degrees or getting jobs. Much of the research examining gender gaps in STEM uses the concept of a "leaky pipeline" (Ferguson, 2016; Sassler et al., 2017) to point to the loss of girls and women at multiple points along the route to a successful career in these fields. Girls are less likely to pursue STEM studies in high school and even fewer young women major in such fields in university, with the subsequent loss of even more women who opt out (or are pushed out) of a career in their field of study (Ferguson 2016).

Considering that engineering is one of the most lucrative and in-demand careers among Bachelor's degree recipients (Ferguson, 2016), explaining these gaps has generated considerable research and policy interest (Sassler et al., 2017). Explanations tend to be grouped in terms of demand-side practices of employers and supply-side skills, abilities, preferences, and choices of workers (Ceci & Williams, 2011; Diekman et al., 2015; Hango 2013). The vast majority of research focuses on explaining why girls and women "opt-out" (e.g. Hunt 2016; Mann & DiPrete, 2013; Syed & Chemers, 2011) with far less exploring what happens to those who "opt-in." In this study, we aim to fill this gap by examining gender differences in duration of the search for a first full-time job by recent engineering graduates in Canada. In other words, we

[1] This chapter has been submitted for publication and currently is under review at the journal Gender, Work & Organization journal. It is co-authored by Dr. Phyllis Rippey and Dr. Ann Denis.

assess those who are still in the "pipeline" to better understand gender differences in experiencing engineering.

We asses four competing arguments regarding expected gender differences or similarities in duration of job search: (1) a worker characteristics model, (2) a pure discrimination model, (3) a feminist split labour market theory, and (4) a gender promotion theory. Using the most recent data available in Canada, the National Graduates Survey 2013 (Statistics Canada, 2013), we estimated Cox proportional hazard models and found support for the gender promotion theory. Women with similar job and individual characteristics spent less time searching for a first job than men.

Literature Review

Engineering as an occupation has always been filled predominantly by men (Andrews et al., 2015). In 2016, women made up only 12.8% of working engineers in Canada according to Engineers Canada (2018). Women are often paid less (Acker, 2009), less likely to develop their engineering careers (Jacobs, 1989), more likely to experience harassment (Quinn, 2002; Rosser, 2003), and more likely than men to quit the occupation (Hill et al., 2010; Mills et al., 2014). Further, mothers who are engineers face even greater hurdles of balancing their family and work lives than others in the profession (Ranson, 2005; Stone, 2007). In short, past research demonstrates that professional inequality based on gender was one of the persistent features of engineering occupations that resulted in women's underrepresentation in the occupation.

Because entry into a STEM career requires higher education, much attention has been given to increasing the number of women participating in university programs as a means of remedying inequality in the labour market (Adams et al., 2011; Freeman et al., 2014). Various educational initiatives have been introduced by universities triggering an unprecedented number

of women entering engineering programs in Western countries, including Canada (e.g, Engineers Canada campaign 30 by 2010), during recent decades (Burke & Mattis, 2007; Hango, 2013; Huang et el., 2000). In 2011 in Canada, 39% of younger STEM university graduates (aged 25-34) were women compared with 23% in the cohort of STEM degree holders nearing retirement (aged 55 to 64) (Hango, 2013). The career prospects of these younger women promised to be bright and prosperous, especially in the context of the knowledge economy (Herzenberg et al., 2000).

The knowledge economy was presumed to potentially create job opportunities and eradicate professional inequality between men and women in many occupations in technological sectors including engineering (Giddens, 1991). This assumption was based on the argument that job seekers in the context of the knowledge economy would compete for jobs based on their knowledge and skills, not their ascribed characteristics (Benner, 2008). The new economy also modified engineering jobs and ways of working (Herzenberg et al., 2000; Benner, 2008). Short-term project-based jobs, flexible working hours, and working from alternative places have become realities for engineers in the Western world (Evetts, 2003; Mills et al., 2014). These changes were thought to remove the work-life conflict that hindered mothers from realizing their career success, and thus were seen as allowing women to develop their careers, leading to diminished professional inequality in engineering (Perrons, 2005). Therefore, in the case of Bachelor of Engineering (BEng) graduates, some argue that the only thing left to explain gender differences in occupational outcomes are gender differences in skills, knowledge, and preferences (Ceci & Williams, 2011), or, as Mills et al. (2014) argue, gendered differences in cultures regarding occupations.

However, the promise of the knowledge economy, predicting an abundance of jobs in the technological sector, has not materialized into job opportunities. In fact, reports from Engineers Canada (2016) and the Ontario Professional Society of Engineers (OPSE, 2015) document a significant shortage of engineering jobs. As a result, many male graduates from these programs have struggled with long, frustrating job searches, often resulting in a job unrelated to engineering (Brown et al., 2004; Ferguson & Wang, 2014). Further, permanent positions in engineering are rare (Benner, 2008; Kalleberg, 2009) and job permanency in engineering varies based on gender (Tang, 2000).

As men's stable jobs have been replaced by contract-based employment, men's breadwinning role has diminished, shifting greater family financial responsibilities onto women (Beneria et al., 2015). These shifts in the economy have often been linked to women's unprecedented numbers entering university STEM programs and the workforce in Western countries in past decades (Burke & Mattis, 2007). However, recent studies show that many women graduates in engineering never enter the occupation or leave it shortly after they begin working (Goldin & Katz, 2008; Jones et al., 2013). Those women who find initial jobs in engineering are, in general, paid less than men in Canada (NSERC, 2010), the USA (Treleaven, 2015; Alexander & Hermann, 2016), UK, and Australia (Franzway et al., 2009).

Moreover, the knowledge economy workplace transformations, such as flexible working hours, and working from an alternative place, have turned out to be flexible penalties, especially for women in engineering (Munsch, 2016). In engineering, according to Munsch (2016), women who used flexible working arrangements were not only paid less but also saw fewer career opportunities than those who maintained their regular presence at workplaces. Moreover, based on research from the USA (Hill et al., 2010; Meyer & Marx, 2014; Crawley, 2015), the persistent

issue of sexual harassment in engineering workplaces has not been eradicated, leading some women to leave the occupation. Overall, there is much evidence that women fare worse than men in many aspects of engineering.

However, there are some ways in which women engineers may be doing better than their male counterparts or than women in other fields, in terms of over-qualification and time to a first job. According to her analysis of Statistics Canada data, Ferguson (2016, p.25) reports that in 2011 those in architecture, engineering, and related technologies had the lowest rates of over-qualification among all occupations; only 7% of women in general felt they were overqualified for their jobs compared with 5% of men in the same fields or, with the 29% of non-immigrant women in the humanities. Thus, there is variation among women, but in general, engineering is a career path that leads to lower rates of over-qualification for the job than do other occupations (Ferguson, 2016).

Not only are women in engineering less likely to feel overqualified for their jobs than men or women in other occupations, there is some evidence that women in engineering have shorter job searches than either women in other fields or men within engineering. More recent studies from Europe have demonstrated that women who graduated from BEng programs found their first engineering jobs sooner than men (Salas-Velasco, 2007). According to a US study, however, women had longer transitions from university Bachelor programs to engineering jobs than men (Freeman, 2006).

According to Sassler et al. (2017), all engineering majors were more likely than all other STEM majors to become employed in a STEM occupation and this relationship was *stronger* for women than for men. Specifically, "women who completed a degree in engineering had odds of entering STEM jobs that were 5.6 times larger than the odds for women who had majored in the

hard sciences… [while m]ale engineering majors were no more likely to be working in STEM occupations within two years of college graduation than were men who majored in the hard sciences or computer science" (201). Further, according to Ceci and Williams (2011), at the level of university hiring, more than one study show that women with PhDs in engineering are more likely to be interviewed and hired than are men with PhDs in engineering. They therefore conclude that discrimination is now a phenomenon of the past that should be discarded as an explanation for the persistent lack of women in engineering. Rather, they suggest that women's underrepresentation is caused by women's preferences and fertility intentions, "both free and constrained" (Ceci & Williams, 2011:3161).

However, the suggestion that women's occupational entry into engineering is no longer constrained by patterns of discrimination assumes that discrimination is present only if women are barred from entry into the occupation. Considering that engineering remains a white male-dominated occupation (Hacker, 2017; Hango, 2013), and that women continue to be paid less than men and have higher rates of turnover (Beasley & Fischer, 2012; Shen, 2013), the jury would appear to still be out as to whether the problem of discrimination in engineering has been solved.

Theory

Theories to explain gender inequity in the labour market tend to divide arguments in terms of supply and demand. Supply arguments focus on the characteristics of the workers (the supply of labour), and demand arguments on characteristics of the employers. Many of the supply-side explanations for income inequality in general have relied on Becker's (1962) human capital theory that states that individuals' investment in skills and education offers a return in increased wages. As such, the argument goes as follows: if women were to get as much education and

skills as men, they would get the same jobs with the same levels of earnings (at least at an hourly rate). The reason why women are less likely to be in the field or why they are paid less on average (Walters, 2004), is then explained as a consequence of lesser skills, abilities, educational attainment, and preferences. Further, some have suggested that what explains women's lower levels of human capital is the constraints posed by disproportionate family obligations (Ranson, 2005; Faulkner, 2009).

Given that women are entering higher education at higher rates than men in general (Turcotte, 2011), that there have been some decreases in the gap between men's and women's family responsibilities (Mitchell, 2017), and that equity legislation has made overt discrimination against women workers illegal, sociologists and economists have focused on employers to explain why inequalities persist. Statistical discrimination was an early theory to explain how employers could justify not hiring women, even if they had no gender animus and the overall levels of women's human capital were increasing (Bielby & Baron, 1986; Phelps 1972; Reskin 1993; Tomaskovic-Devey & Skaggs, 1999). Arrow (1972) and then Phelps (1972) theorized that when employers have incomplete information about potential productivity gains generated by employee candidates, they will often rely on statistical averages of groups. As Tomaskovic-Devey & Skaggs (1999) summarize it, "If there are average group productivity differences for the target jobs, then the use of gender or race as a screening device is argued to increase average efficiency in labour markets" (423). Despite the simplicity of this argument, in their analysis Tomaskovic-Devey & Skaggs (1999) find no empirical evidence of an association between establishment productivity and the gender or race composition of the workers.

Based on this contention that employers make rational decisions and that their employee selection is not based on a biased preference for men, if women were not less productive than

men, employers would stop discriminating against women once their productivity equivalencies became apparent. As Bielby & Baron (1986) note in their seminal work, presumably employers would eventually figure out that the preferential hiring of higher paid men was affecting their bottom lines, if there were no other value-added benefits from hiring these more expensive workers. However, we know empirically that despite a lack of economic rationality, some employers still engage in the practice. Using organizational level data from California for 1964-1979, Bielby & Baron (1986) demonstrate clear gendered sorting into occupations across fields and also into particular roles within organizations even when the actual tasks or roles carried out by men and women were often so similar that they merited being considered the same occupation. For example, school bus driving may be considered "women's work" whereas city bus driving is considered to be "men's work." As such, men and women are performing essentially the same job with very different rewards associated with it. They point to gendered assumptions about turnover costs: women are assumed to be more likely than men to quit at marriage or with the birth of a child, thus women are sorted into jobs with lower turnover costs, which tend to be lower paying jobs. Different from supply-side theorists who claim women *are* more likely to quit because of family, however, these theorists suggest that *employers* identify family as a reason to discriminate even when evidence does not support the claim.

Although most research focuses on the workers' and employers' characteristics, there is a third party who also may influence labour market patterns: other workers already in the job. Bielby & Baron (1986) suggest that because discrimination is not efficient or rational for their bottom line, employers without "tastes for discrimination" might nonetheless discriminate if male employees do, and thus demand a wage premium to be willing to work with women. Tomaskovic-Devey & Skaggs (1999) also found no association between productivity and the sex

and race composition of workplaces but similarly suggested the possibility of a social closure effect, as discussed by Bonacich (1976).

Bonacich first developed her theory of ethnic antagonisms and split labour markets broadly in Bonacich (1972) followed by her application of this theory to Black/White relations in the United States in Bonacich (1976). Similar to Marx's theory of a surplus army of labour, her theory suggests that there are three parties involved in labour market outcomes: employers/businesses, higher paid labour, and lower paid labour. She argues that employers aim to set the price for labour as low as possible and this is facilitated by having a lower paid labour force that can undercut the higher paid labour force. The higher paid labour force is therefore highly threatened by the lower paid labour force which can lead to antagonisms. Although the cheaper labour is threatening to the higher paid labour, they are not intentionally trying to undermine the other workers. As she writes, "it is paradoxically [the lower paid labour's] weakness that makes it so threatening, for business can more thoroughly control it" (Bonacich, 1972: 554). As such, the nature of the antagonism is fundamentally a class antagonism, according to Bonacich, but takes the appearance of ethnic antagonism if the labour market is split along ethnic lines (Bonacich, 1972, p.553). In passing she suggests (1972) that this analysis can also be applied to gender.

Given that sex segregation has been a persistent characteristic of the United States and Canadian labour markets over the history of industrial capitalism (Armstrong & Armstrong, 2010; Mies, 1998; Reskin,1993), one can see that these split labour markets are not based on ethnic antagonism alone but also on sexism. Considering that "women's jobs" have consistently been lower paid with fewer growth opportunities and that when "men's jobs" become feminized (e.g. clerks to secretaries), the jobs become devalued and lower paying (Reskin, 1993), one can

see an economic disincentive for men to support the entry of any women into their workplaces. This is further compounded in an economy increasingly characterized by precarious and lower paid jobs in general (Pupo & Thomas, 2010).

This economic disincentive is reinforced when men can close off access to the material benefits of paid work and thereby both increase the value of their own work and limit others' access to valued social resources (Hartmann, 1979). This further entrenches male dominance in all spheres of social life (You, 2015) and increases the social value of what is associated with men (Wittig, 1992). As a result of this, women are more likely to be relegated to unpaid labour in the home providing free services to men, further shoring up the latters' dominance in this patriarchal structure, and contributing to what Armstrong and Armstrong (2010) have called the "double ghetto": unpaid labour at home and low paid jobs in the workforce.

This split labour market theory is fruitful for understanding the shifting landscape of the engineering labour market. If this theory is correct, then we will see that discrimination against women may be coming from other workers rather than from employer tastes. Given the evidence of persistent sexual harassment in the occupation (Ollo-López & Nuñez, 2018), there is evidence of an antagonistic relationship between male and female engineers. Thus, if male workers want to keep wages high and see women as a threat, these workers will discourage women from working and employers can profit from this antagonism by hiring women engineers at a lower rate than men. If this theory is correct, then we would expect to see women hired more quickly than men, but with women being paid less.

What none of these theories allow for, however, is the possibility that employers prefer to hire women over men. The recent spate of pay equity and diversity initiatives implemented across engineering organizations in Canada (Crawley, 2015; OPSE, 2018) , perhaps resulted in

employers hiring women as soon as possible to increase their workforce diversity. Further, there is evidence that qualified women in top management positions improve firm performance (Smith et al., 2006) and that "increasing proportions of women in an occupation beget even more women in that occupation" (Cohen et al., 1988: 712), especially at lower ranks. Thus, employers may be seeking to hire women both because they see women as having a positive impact on their companies and because of a snowball effect as women increase in number. As such, we offer an alternative theory that employers may actually prefer to hire women.

Such a proposal is not, however, explored in the literature. To address this gap, we examine gender differences among recent engineering graduates in the amount of time taken to find a first job. By looking only at those who were actively seeking their first job after graduation from a BEng program, we are able to control for supply-side explanations that suggest women are less likely to become engineers simply because they are not interested in studying or working in engineering. By looking only at recent graduates, we also are able to control for cohort effects that might better explain why there are fewer senior engineers compared with entry-level engineers.

Hypotheses

Based on past theories, we hypothesize that if supply-side human capital theories explain gender differences in occupational outcomes, then we should see no gender differences in duration of job search, controlling for levels of human capital [H1]. Secondly, if discriminationory outcomes are truly a result of demand-side employer distaste for women, then one would expect women to take longer to obtain a first job *and* be paid less than white men, even when controlling for human capital [H2]. If the split labour market theory is correct, we should find that women will be more valuable to employers due to their lower labour costs and

therefore they will be hired more quickly but paid less than men, even controlling for human capital [H3]. Finally, if women are not being discriminated against at the point of hire, we should find that women are hired at least as quickly as men without being penalized in their incomes [H4].

Methodology

Sample

To test these hypotheses, we analyzed the most recent cycle available of the National Graduate Survey (NGS). This is a cross-sectional sample survey, which is repeated every five years by Statistics Canada. The NGS 2013 cycle examines the labour market experiences of those graduating in 2009/2010 from Canadian public universities, community colleges and trade/vocational programs (Statistics Canada, 2013). The survey's primary objective is to obtain information on labour market experiences of graduates, focusing on their employment, occupations and the relationship between their jobs and education. Data for this cycle of the survey were collected between April and September 2013 from respondents who answered the questions voluntarily, using a computer-assisted telephone interview (CATI).

The survey contains information on 9,400 individuals who graduated from BEng programs in Canada. The target population for this study included only those who graduated from BEng programs and were employed full time after graduation. Engineering graduates not included were those who were pursuing further education, were not active in the labour market or only employed part-time, had left the formal labour market, had missing information about their activities after graduation, or were employed outside of Canada. All the graduates included in the present study had completed their degrees without interruption and did not work full-time[2]

[2] Full-time job is defined as more than 30 hours per week for more than six months.

before or during their engineering programs. In other words, we limited the scope of our analysis to the labour market transitions of those who went directly from full time studies to full time employment. After application of all the above restrictions and deleting missing-data the sample size consisted 2,856 individuals, 86% men and 14% women. We also eliminated left and right censored cases to remove any respondent who had not started looking for a job after graduation or those who never found a job within the observation period of 1,076 days since graduation.

Measures

The dependent variable in this study was duration of search to obtain first full-time employment of any type, which was derived by subtracting the date of first full-time job after graduation from the graduation date. Within the Cox model used, this "variable" is actually entered as two variables, one to indicate whether the event occurred (i.e. did the respondent get a job) and the other to indicate the time it took to occur.

The main independent variable in this study is a dichotomous measure for gender, where 1 indicates female, and 0 indicates male. To assess hypotheses related to earnings, we included a self-report of income[3]. Based on Statistics Canada information about the average income of BEng graduates (Ferguson & Wang, 2014) and interquartile test for outliers (Hahn & Meeker, 1991), we identified approximately 10 cases of influential outliers that we deleted from our sample. The final sample size was 2,456. We then log-transformed (log(10)) the variable to account for the typically non-linear impact of income on a dependent variable (Marascuilo & Levin, 1983). As such, the income coefficient should be interpreted in terms of percentage changes in income on the dependent variable, rather than as absolute dollar increases. We also

[3] Alternative models measured income as an interval variable with and without outliers, as a natural log, as a base 10 logged variable and as a quadratic. Based on the AIC tests and goodness to fit tests, we determined that the base 10 log best fit the data.

controlled for other job characteristics including whether the first job is permanent (1 = permanent / 0 = contract, seasonal, or casual) and respondent's self-assessment of whether their job is relevant to their engineering program (1 = yes / 0 = no). To control for human capital, we included a self-reported measure of academic performance (1 = graduated in the top 10% of their class/ 0=graduated below top 10%) and participation in a co-op program (1 = yes /0 = no). We also controlled for mothers' and fathers' level of education, both as dichotomies for Bachelor's degree or higher (1) or below a Bachelor's degree (0). Finally, we included demographic controls for race (1 = visible minority / 0 = "white") and geographic location of the job (1 = Ontario / 0 = rest of Canada)[4]. We also constructed and tested several interaction terms[5] to assess the effect on the duration of job search to the first job.

Method

In order to assess whether there are overall average differences in men's and women's time to first job for engineering graduates, we first calculated descriptive statistics with t-tests for differences between means using the software program STATA to see which factors explain these differences; we then used Cox regression models (a.k.a. survival analysis or proportional hazard regression) to control for individual and job characteristics. All analyses corrected for the complex survey design,[6] in order for estimates to be representative of the target population and to

[4] The coding of the Ontario region vs the rest of Canada was made to reflect the 2008/2009 loss of the automotive sector in that employed many engineers in the province.
[5] Some interaction terms were excluded because they were tested as not statistically significant in the bivariate analysis. Some were excluded due to small cell numbers (e.g. a 3-way interaction term for mother's educational level, gender and race)
[6] In STATA, this employs the svy set of commands.

prevent biased estimators. We also tested for interactions between gender and each independent variable, one at a time, but none was statistically significant.

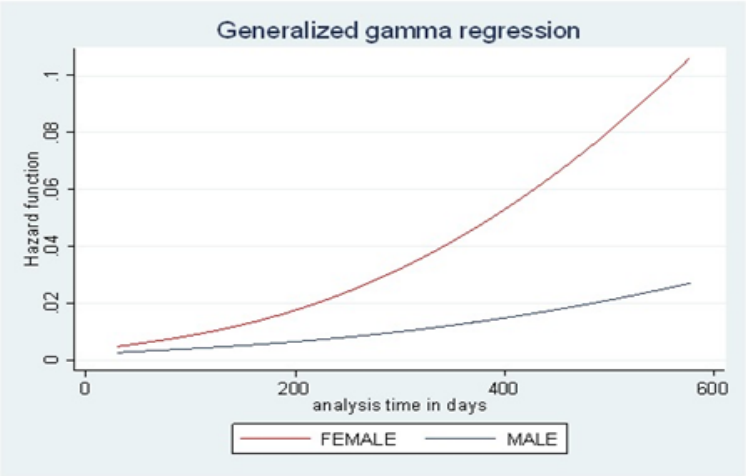
According to Cox & Oakes (1984/2018), survival analysis is a statistical method used when "interest centres on a group or groups of individuals for each of whom (or which) there is defined a point event, often called a failure, occurring after a length of time called the failure time. Failure can occur at most once on any individual" (1). Such methods are called survival analyses typically in medical research, as they are used to assess how long groups of people being treated for an illness are able to survive. In that context, "failure" refers to the point at which the participant died. In our own case, "failure" refers to getting a job (which in common parlance is typically as seen more as a success than a failure). Such methods are superior to Ordinary Least Squares (OLS) models since time to "failure" is not normally distributed, thus violating a key assumption required for calculating an OLS model. Cox & Oakes (1984/2018) further note that one could simply include all respondents together in a binary logistic regression model to determine whether or not the respondents survived, but this does not allow for measurement of how long each participant lasted.

Cox regression results are often interpreted in terms of a hazard ratio, indicating the risk of failure. A hazard ratio greater than 1 means a ''high risk of failure'' (Cleves et al., 2008). Somewhat confusingly, therefore, a higher risk of failure indicates a *shorter* predicted job search duration, since the failure event happened more quickly. To improve the interpretability of our results we also calculated the predicted job search duration for men and women given different values on the explanatory variables.

Results

The first step in our analysis was to estimate the Kaplan-Meyer hazard function, which is a way to graphically show the data distribution over time. The hazard in the case of this study is finding a job. From Graph 4, we see that the lines representing a cumulative hazard function for men and women are not parallel. Specifically, women's probability of finding a job within 200 days is twice as high as is men's, and there is a nearly 100% chance that women will find a job by 600 days compared with only a 20% chance for men. This result suggests that differences between men and women in the rate of finding a job might be significant (Long & Freese, 2014). To measure the significance of the differences in finding a job between men and women, we conducted descriptive statistics.

Graph 4: Hazard function for BEng graduates by gender, NGS 2013.



The descriptive statistics shows that women find any job more quickly than men, and that the difference in days between men and women is even greater among those obtaining a job relevant to engineering (see Table 1). Specifically, women's an average job search duration for an engineering job was 58 days, compared to men's average job search duration for an equvalent job of 141 days. Men are also statistically significantly ($p<0.01$) more likely to have graduated

with a coop program than women, with 42% of men and 19% of women engaged in such programs. This finding lends some support to the hypothesis that men have higher levels of human capital than women, although there is not a statistically significant difference in the percentage of men and women graduating in the top 10% of their class. Further, although women in the sample were earning less money on average than men in their first engineering jobs, this difference is not statistically significant. These results offer evidence against [H1] and [H3] that suggest that employers prefer to hire men over women, and limited evidence for [H4] that employers are getting women workers at a lower cost. Further, as none of the other explanatory variables had signifcant differences between men and women at the descriptive level, there is little evidence that they are likely to explain why women are getting jobs more quickly than men.

Table 1. Descriptive Statistics (NGS, 2013)

	Male	Female
Duration to any first job after the graduation, in days	152***	82
Duration to first engineering job after the graduation, in days	141**	58
Visible minority	37%	41%
Job closely or somewhat related to engineering (vs. not related at all)	80%	67%
Permanent Job (6 months or more) (vs. non-permanent contract, seasonal, temporary, or casual)	63%	60%
Mean annual income	$44,750	$40,375
Participated in a co-op program	42%**	19%
Graduated in the top 10% of the class, self-report	15%	7%
Mother has higher than a Bachelor's degree (vs. bachelor's degree or less)	43%	22%
Father has higher than a Bachelor's degree (vs. bachelor's degree or less)	41%	57%
Ontario (vs. other Canadian province)	39%	11%
N	2113	343

*Note: Results are weighted; * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$*

In order to assess factors that shaped these gender differences in duration of job search and labour market outcomes we estimated the Cox proportional hazard model. Table 2 presents hazard ratios, and standard errors in brackets, obtained from the Cox regression model that contained all variables included in our analysis. Based on these results, we can see that there are statistically significant differences in the duration to first job between men and women, at the $p<0.001$ level (see Table 2). However, none of the other variables that measured human capital, socio-economic status, job characteristics nor the control variables were significant and were unlikely to predict the duration of job search for these graduates.

Table 2. Cox exponentiated model hazard ratios for the duration to first job (in days) for BEng graduates in Canada (NGS 2013*)*.

	Full Model Hazard Ratio
Women	2.034***
	(0.335)
Members of visible minority	0.853
	(-0.135)
Father's education > Bachelor Degree	1.302
	(-0.251)
Mother's education > Bachelor degree	0.672
	(-0.138)
Participated in Coop	0.814
	(-0.154)
Graduated in the top 10% of the class, self-report	0.744
	(-0.215)
Job is relevant to engineering	1.302
	(-0.248)
Job is permanent	1.345
	(-0.256)
Annual income Logged(10)	1.152
	(-0.544)
Ontario vs The rest of Canada	1.002
	(-0.208)
N= 2456	

*Note: Results are weighted; * $p \leq 0.05$; ** $p \leq 0.01$;*** $p \leq 0.001$; (standard errors in parenthesis)*

To further clarify our results, we first calculated the predicted duration of job search for men and women for those only in an engineering-related job. Then we calculated predicted duration of job search for those in engineering-related jobs with a salary equivalent to the male graduates' average (see Table 3). What we see here is that even in engineering jobs with equivalent salaries women are still obtaining their jobs more quickly than men. Specifically, controlling for all other factors, women who end up in jobs relevant or somewhat relevant to engineering are predicted to take on average 37 days to find their job compared to 81 days for men. Further, although the gap narrows somewhat, within equivalently paying engineering-related jobs women are still getting jobs more quickly than men (50 vs. 83 days). We, however, see a slightly longer duration job search for engineering jobs that pay the male graduates' average income. Notably, the duration to attain a job that pays at least average wages increases more for women than men.

Table 3. Predicted duration of job search in days for BEng graduates based results from Cox Hazard Models (NGS 2013)

	Men	Women
Duration of the job search to the first job that is relevant or somewhat relevant to engineering, all other variables set to zero or mean	81***	37
Duration of job search to the first job that is relevant and somewhat relevant to engineering and pays $44,750 per year, all other variables set to zero	83***	50

*Note: Results are weighted; *p ≤ 0.05; ** p ≤ 0.01;*** p≤ 0.001*

In summary, according to these results, women are obtaining engineering jobs, equivalent to men's jobs, significantly sooner than men. There is no evidence that at the point of labour market entry, women are less qualified [H1], or that there is discriminatory behavior by employers [H2/H3], as women in engineering are actually being hired more quickly than men. Thus, we found support for our hypothesis that employers are not discriminating against women

at the point of hire [H4]. Women were hired more quickly than men, without experiencing a statistically significant penalty to their incomes.

Discussions and Conclusion

The purpose of this study was to analyze gender differences in the duration of search for the first job in Canada by 2009/2010 BEng graduates from Canadian public universities. The findings suggest that women spent significantly less time searching for their first job than men. There were no statistically significant differences between men and women in terms of salary or whether the first job was relevant to engineering or a permanent position.

Although based on the available variables, we cannot make definitive conclusions about why women are getting jobs more quickly, nor why there remain other inequalities among engineers already on the job. We believe that these results are suggestive of a positive benefit of engineering diversity programs such as described by Burke & Mattis (2007) that may be encouraging employers to hire women. Another possible explanation is that because there are relatively few women who seek jobs in engineering, those who make it may be particularly high achieving profesionals. The yet unpublished study on highly achieving women engineers at the time of their mid career that was conducted by the NSERC - Pratt & Whitney Chair for Women in Science and Engineering (Ontario Region) showed that upper engineering management is interested in their career development and is open to gender diversity in the workplace. Such attitudes of engineering upper management might affect hiring policies in the organization and result in women's rapid entry into the occupation (NSERC, 2019).

While this work provides evidence that employers are hiring women more rapidly than men, these results should not be used to dismiss the facts that engineering continues to be a male dominated occupation and to have disproportionately higher rates of sexual harassment against

women than other fields (Quinn, 2002). However, if employers are scooping women engineers up more quickly, this points to trace evidence for what split labour market theory would suggest: women's underrepresentation in engineering may possibly be due to the culture of engineering workplaces that might create an antagonistic relationship between men and women engineers, rather than overt hiring discrimination on the part of employers. However, we cannot know this from these data, and future research would be warranted to better answer this question.

Our research is not without limitations. While our results provide some insights about the BEng graduates' early career experiences in the occupation, many of the variables that might influence duration of job search were not included in the analysis. For example, the effect of a reported shortage of engineering jobs in Canada, differences among branches of engineering, as well as the social networks of graduates were not measured in this analysis, and could not be measured using the NGS 2013 data set. Moreover, the results of this study cannot be generalized to all engineers because our study focused on younger engineers, who are less likely to be married or have children than all engineers on average. Future research is also needed to analyze the experiences of visible minority women (and visible minority men) transitioning from BEng programs into the world of work. In this study, the analysis of the combined effect of gender and ethnicity was impossible due to small numbers of visible minority women in the sample. The information about their experiences might provide a better understanding of the nature of changing demographics in engineering workplaces.

In summary, our study assesses competing theories to explain gender differences in duration of first job search of recent engineering graduates entering the labour market in the context of knowledge economy in Canada. We found women take significantly less time to find a first job in engineering than do men, controlling for job and human capital characteristics of the

recent graduates. We suggest that these results may possibly be due to recent diversity initiatives and employers' preference for hiring women with BEng degrees; however, we have no means to test these assertions. What we can argue, based on our study results, is that the transition to the world of work continues to be defined by the gender of graduates.

CHAPTER 3. Gender Differences in Job Satisfaction of BEng Graduates in Canada[7]

Introduction

The study of gender and job satisfaction has often produced inconsistent and inconclusive results. Some studies show no gender difference in job satisfaction (Sabharwal & Corley, 2009; Zou, 2015), whereas others produce paradoxical results indicating that women are more satisfied than men, even in jobs with fewer of the "good" characteristics of male dominated jobs (Hakim, 1991; Hill et al., 2010). This paradox is often explained by women's lower expectations for their jobs compared to men, due to differences in socialization and because women compare themselves to other women rather than to men. However, general studies on job satisfaction may be concealing a gender difference at higher occupational levels where women have similar motivations and skills compared to men and expect similar rewards from their jobs. Further, much of the limited past research on gender differences in job satisfaction is from the 1990s in the United States looking at one female dominated occupation—nursing (Sparks et al., 2004; Pietersen, 2005). As such, whether these patterns persist today in Canada or whether they exist in male-dominated occupations is not known.

The current study addresses this gap in the literature by investigating whether there are gender differences in job satisfaction among engineers and, if so, how we can explain them. Drawing on past literature, we use a logistic regression model to address these questions using the most recent data from the National Graduates Survey (NGS) 2013 (Statistics Canada, 2013) to analyze gender differences in the job satisfaction of 4,236 Canadian BEng graduates who worked in engineering three years after graduation. We found that women are more satisfied with their jobs than men. Due to few gender differences in both objective job characteristics and

[7] This chapter has been submitted to for publication and currently is under review at the Journal of Women and Minorities in Science and Engineering

subjective feelings about the jobs, we cannot draw strong conclusions as to why this is the case. However, this research makes an important contribution to the literature by raising the point that if women are more satisfied with their jobs than men, then the low rates of retention in engineering jobs of women engineers in Canada cannot rest on the assumption that women do not like their jobs.

Literature Review

Job Satisfaction

Much of the research relies on Locke's definition (Locke, 1969, p. 113) of job satisfaction as a "pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences." In other words, job satisfaction refers to the positive *feelings* one has about one's job. In general, job satisfaction has been correlated with positive benefits for both organizations and workers, including greater motivation, job involvement, organizational commitment, productivity, mental health, and reduced absenteeism and turnover (Price, 1997). Thus, workers who are more satisfied with their jobs tend to be better workers and happier with their lives in general.

What leads to higher job satisfaction has been a topic of debate since at least the 1970s. According to Quinn et al. (1974), in general, regardless of occupation, those with a more interesting and autonomous job and a friendly and inclusive work environment tend to have higher levels of job satisfaction. Further, jobs with such extrinsic rewards as higher than average income, fringe benefits, regular working hours, and career development opportunities as opposed to those with monotonous tasks, low pay, few career opportunities, and long working hours, have been shown to have higher levels of job satisfaction (Kalleberg, 1977).

Gender and Job Satisfaction

The effect of gender on job satisfaction has frequently been examined; however, the results are inconclusive. Some studies have shown women to be more satisfied than men (Clark, 1997; Hodson, 1989; Murray & Atkinson, 1981; Zou, 2015), whereas other studies have shown men to be more satisfied than women (Jagacinski, 1987; Sousa-Poza, & Sousa-Poza, 2003 Kim, 2005). In some other studies, researchers found no difference in job satisfaction between men and women (Bender et al., 2005; Watson & Meiksins, 1991). Those studies that showed women's higher level of job satisfaction with "lesser" jobs than men's have often referred to this as a gender paradox (Mueller & Wallace, 1996). However, the literature repeatedly indicates that the findings regarding the level of job satisfaction based on gender are inconsistent.

There has been limited research on engineers' job satisfaction but research on other professionals are similarly inconsistent. For example, Clark (1997) claimed that women who work in jobs that require a university degree and in male-dominated occupations are as satisfied with their jobs as men, or even more so. On the other hand, Chiu (1998) investigated the job satisfaction of lawyers, a traditionally male-dominated occupation that requires a university degree and found significantly lower levels of job satisfaction for female than male lawyers. Smith & Plant (1982), however, found no meaningful gender differences in job satisfaction in their analysis of 51 pairs of professors who were matched in terms of academic department, rank, highest degree, and years of service. In a more recent study on the job satisfaction of physicians, Burke et al. (2009) also found no differences in the levels of job satisfaction among 237 male and 194 female doctors. Female physicians, however, reported more work-family conflict and psychosomatic symptoms, and they tended to be absent more.

In analyses of gender differences in job satisfaction, many empirical studies have focused on three main topics: differences between men's and women's objective job characteristics,

subjective feelings about jobs, and family obligations. Gender differences in objective job characteristics include concepts such as job relevance to formal education, supervisory status, working hours, and job permanence. For example, an early study by Rosenbach et al., (1979) found that some gender differences in job satisfaction are due to women's lower positions in the organizational hierarchy. Acker (2006) argued that women were more likely than men to be in jobs below their level of education. Hodson (1989) added women were more likely than men to work in jobs unrelated to their field of studies (i.e. underemployed). A study that measured the effect of underemployment on job satisfaction found that those who are underemployed are more often less satisfied with their jobs than those who are not (Kalleberg, 2008). However, in the case of gender differences, the results are inconclusive.

Other studies analyzed gender differences in job satisfaction at the managerial or supervisory levels. Women have been shown to be less likely to work in supervisory roles (Kanter, 1977; Ranson, 2003), while other studies found that women feel dissatisfied when they meet roadblocks to their career development (Cech & Blair-Loy, 2010; Evetts, 1993; Ranson, 1998). Yet, a recent study by Lup (2018), who analyzed gender differences in job satisfaction at the managerial level in the current economic conditions, found that women are less satisfied with their jobs than men. Other studies have also shown that women experience high levels of stress in high-level managerial jobs and often leave such positions (Stone, 2007). When men work in managerial jobs, on the other hand, they often have been shown to have a higher level of job satisfaction than women (Dodson & Borders, 2006) .

Another frequently examined objective job characteristic in relation to overall job satisfaction is working hours (Miller, 1980). According to Bültmann (2012), women were shown to be less satisfied than men with jobs that require longer hours and rigid work schedules. Others

who have studied the effect of working hours on professional workers have found no gender differences in relation to the length of their work day (Post et al., 2009). In some studies, women have attached greater value than men to more flexible working hours over traditional "nine to five" hours (Golden, 2008). In general, both men and women disliked working longer than normal hours (Pencavel, 2015).

The effect of job permanency on overall job satisfaction is another long-standing subject of study (Rosenbach et al., 1979). Women occupy short-term contract positions more frequently than men (Acker, 2009; Adelman, 1998), especially early in their careers (Dobránszky & Dobránszky, 2011), and such arrangements have a negative effect on women's job satisfaction (Bystydzienski, 2009). Some studies found that women prefer permanent positions to contract-based ones (Polkowska, 2014), whereas men prefer working in contractual positions (Yadav et al., 2017). The work of several other authors showed, however, that working in contract-based, non-permanent positions is equally stressful for both men and women and resulted in reduced job satisfaction for both (Benner, 2008; Kalleberg et al., 1997). All in all, the evidence indicates that contractual work has a negative impact on women's job satisfaction, but the impact on men's job satisfaction differs between studies.

Another stream of literature analyzed gender-based differences in subjective feelings about specific aspects of jobs. Some studies assessed the effect of feeling overqualified for a job and feeling (dis)satisfaction with pay (Blau & Kahn, 2000; Currall et al., 2005). For example, studies from the United States showed that women feel satisfied with jobs even in cases when they are objectively overqualified (i.e. having qualifications that exceed a requirements for a particular job) for them (Cheryan, 2012; Sousa-Poza & Sousa-Poza, 2007). Miller (1980) and

Weaver (1978) pointed out that in the case of professional workers, these feelings of being overqualified have a similar negative effect on job satisfaction for both men and women.

Another frequently analyzed subjective feeling that is an influential factor on overall job satisfaction is the feeling of being satisfied with money made at the job (Blau & Kahn, 2000; Cheryan, 2012). For example, Cheryan's (2012) study showed a gender-based paradox, as women reported feeling as satisfied with their lower pay as men with higher pay. However, in the case of professional women, the gender pay inequality often leads to women's overall dissatisfaction with the job (Cech, 2013). In other words, existing evidence shows that men and women are satisfied with different levels of pay, which leads to gender differences in job satisfaction (Miller, 1980).

With the increase of women's participation in the labour force, the question of the effect of women's family responsibilities on their job satisfaction has also been examined (Legault & Chasserio, 2003). For example, Mortimer et al. (1988:113) found that women's job satisfaction is more affected by family responsibilities than is men's. Other studies have found no gender differences in job satisfaction based on marital or parental status of workers with university degrees (Ayre et al., 2013; Hall et al., 2012). One study found that family obligations affect men's job satisfaction more positively than women's job satisfaction (Ranson, 1998). A European study linked women's family responsibilities to their job dissatisfaction and exits from the labour force (Dobránszky & Dobránszky, 2011).

Overall, the existing evidence suggests that satisfaction with objective job characteristics, subjective feelings about these characteristics, and family obligations are important predictors of job satisfaction, and there is some evidence that the impact of these factors on job satisfaction may vary with gender.

Gender Differences in Engineering

Since the first women entered engineering programs, gender scholars have been studying women's experiences to explain their underrepresentation in the occupation (Burke & Mattis, 2007; Fouad et al., 2016; Robinson & McIlwee, 1992; Perrucci, 1970; Ranson, 2003). Existing studies have tested gender differences in objective job characteristics (e.g. salary, working hours, managerial role) of men and women in engineering (Xu, 2008), their subjective feelings about these job characteristics (Ayre et al., 2013), and the effect of family responsibilities (Legault & Chasserio, 2013) as determinants of job satisfaction that lead to women's low participation in the occupation.

A large body of literature points out that women who graduate from engineering programs often do not enter the occupation or they leave it shortly after they start working (Cech et al., 2011). A large proportion of these graduates were employed working in jobs not related to engineering (Bratti et al., 2004; Passaretta & Triventi, 2015). In their study of women engineers Ayre et al. (2013) argued that these women are genuinely interested in engineering jobs and therefore working in any other type of job is dissatisfying for these women. Another objective aspect of engineering jobs that was examined and identified as unsatisfactory to women is the lack of permanency in their engineering jobs (Devine, 1992; Robinson & McIlwee, 1989). Early studies pointed out that women, especially in the early stages of their careers, were often hired in non-permanent engineering jobs because women are expected to start families and therefore they are expected to leave the labour force to take care of their families (Ranson, 2005). In their study in Europe, Dobránszky & Dobránszky (2011) showed that because women often start their engineering careers in non-permanent jobs they have to delay their motherhood until they obtain permanent positions. Moreover, engineering jobs often require long working hours and as such

have been identified as incompatible with women's family responsibilities, leading to their job dissatisfaction and resulting in women's exit from the occupation (Franzway et al., 2009; Fouad at el., 2011; Hunt, 2016).

As in the more general studies above, feeling overqualified is important for women in engineering, but specifically in terms of being dissatisfied with their jobs. Women with engineering degrees are more likely than men to work in supporting and customer service positions in engineering organizations; these jobs are often below the women's level of education (Franzway et al., 2009). Further, Cech and Blair-Loy (2010) found a strong and positive correlation between women's feelings of overqualification and their exits from the occupation. However, other studies showed that women do not feel dissatisfied with jobs in engineering, even in cases when these jobs are below their level of qualification (Jagacinski, 1987; Phelps, 1972).

The most frequently studied subjective feeling regarding job aspects was feelings of (dis)satisfaction with pay (Auspurg et al., 2017; Lips & Lawson, 2009; Olson, 2013). Research examining the gender-based pay gap in the occupation consistently shows that women earn less money than men even when they work in similar positions (Dionne-Simard, 2016). The inequality in pay, some studies argue, leads to women's dissatisfaction with engineering jobs and their exit from the occupation (Meyer & Marx, 2014; Schellenberg, 1996).

Moreover, women's family obligations often have been identified as having a negative impact on women's job satisfaction in engineering (Faulkner, 2009), whereas for men, being married and a parent is linked to increased job satisfaction (Bünning, 2015). Such a gender difference is often attributed to women being primary caregivers to their families more often than

men (Post et al., 2009). However, some other studies, while limited, showed that women's family obligations have no effect on their engineering job satisfaction (Ayre et al., 2013).

In summary, many of these studies conclude that women in engineering are in general more dissatisfied with their jobs than their male peers. More specifically, women's dissatisfaction with engineering has been examined by comparing the objective characteristics of their engineering jobs, subjective feelings about specific job aspects, and the impact of family obligations for men and women. There is consistent evidence that women in engineering have lower levels of objectively positive job characteristics than their male peers, but the evidence on differences in subjective feelings and family obligations are more mixed. While these studies provided interesting insights about aspects that affect women's and men's job satisfaction in engineering, most of these studies emphasized that women became dissatisfied with engineering jobs and therefore left the occupation. More recent studies suggest, however, that many of the objective characteristics of engineering jobs have changed (Rosser, 2003), and these changes have probably modified subjective feelings about these jobs and family obligations.

Over the past twenty years, significant changes have been documented in the nature of work and organizations in general, especially in engineering (Rosser, 2003). Engineering organizations in Western countries have downsized, outsourced production, and adopted various initiatives to diversify their workforce (Baker et al., 2015). In particular, initiatives promoting diversity, a family-friendly work environment, and mentorship have been implemented with the goals of facilitating women's entrance and career development in engineering and reducing their family-work conflict (Heather, 2003; Zywno et al., 1999). Further, according to Ceci & Williams (2011), who analyzed women's experiences in STEM based on 20 years of empirical research, at the level of university hiring, more than one study shows that women with PhDs in engineering

are more likely to be interviewed and hired than are men with PhDs in engineering. They therefore conclude that discrimination is now a phenomenon of the past that should be discarded as an explanation for the persistent lack of women in engineering. Rather, they suggest that women's underrepresentation is caused by women's preferences and fertility intentions, "both free and constrained" (Ceci & Williams 2011, p. 3161).

Thus, taken as a whole, the evidence suggests that the objective job characteristics that were identified as dissatisfactory for women in the past recently have been modified to increase the level of job satisfaction among women and their increased number in the occupation. Coupled with the recent studies (Crompton et al., 2005; Mitchell, 2017) reporting a more egalitarian distribution of family obligations, one can assume that the main barriers for women's participation and career development have been addressed, resulting in women's increased satisfaction with engineering jobs. Despite all these changes, the engineering occupation continues to be male-dominated (Hango, 2013), with women paid less than men, less likely work in managerial positions, and leaving the occupation more often than men (Hill et al., 2010). Thus, the question of whether engineering has become satisfying for women is yet to be answered.

According to Ceci and William's argument and other studies suggesting that recent changes in engineering have had a positive effect on women's experiences in the occupation (Rosser, 2003; Burke & Mattis, 2007), we would expect that women would have the same objective job characteristics as men and therefore be equally or even more satisfied with their engineering jobs. If gender pay inequalities in the occupation have persisted, given the importance of pay satisfaction to overall job satisfaction, one would expect women to feel less satisfied with both their pay and their jobs (Bilimoria & Lord, 2014). Moreover women might be

less likely to feel overqualified for their engineering jobs in the light of the reported shortage of engineering jobs in Canada (Engineers Canada, 2012) and the reported overqualification and job mismatch of their male counterparts (Abel & Deitz, 2016). We also would expect that family obligations would have no or minimal impact on women's job satisfaction in engineering based on the recent analyses regarding the more egalitarian gender distribution of domestic responsibilities (England, 2017).

Theoretical explanations of gender differences in engineers' job satisfaction

Socialization theory and a structural gender theory approach are common theoretical frameworks used to explain gender differences in job satisfaction. Bakan (1966) and Eagly (1987) posit that differences in job satisfaction might be due to differences in socialization between men and women. These authors argue that women are socialized into values, attitudes, and behaviors that are communal in nature, whereas men's socialization reflects agentic values and behaviors. According to the notable proponents of this theory, Bakan (1966) and Eagly (1987), a communal orientation involves a concern for others, selflessness, and a desire to be at one with others, whereas an agentic orientation is manifested in self-assertion, self-expansion, and the urge to master. Locke (1976) applied the socialization argument to understanding gender differences in job satisfaction and explained that satisfaction with any given job element (e.g., pay, career opportunities, working hours) is experienced as the result of a comparison of a specific job outcome with the associated value held for that outcome, and if there are systematic differences in the job-related values of women and men then there are gender differences in job satisfaction. Thus, similar elements of a job might be perceived as differently satisfying for men and women, resulting in various levels of job satisfaction with the same objective job characteristics.

Socialization theory is often contrasted with the structural view. Risman (2004) argued that conceptualizing gender as a social structure embeds gender in the individual, interactional, and institutional dimensions of our society, rather than as just within individual development. According to the structural critique of socialization theory, differences between men and women, due to early socialization, will be modified by the rewards and costs associated with occupational roles (Collins, 1975; Kanter, 1977). These theorists argue that the nature of work shapes behavior through the structure of rewards, resulting in men and women responding similarly in the same occupational environment. In other words, as Lacy et al. (1983) suggested, men and women in a given occupation will exhibit the same priorities on a wide range of occupational attributes: money, advancement, freedom from supervision, and so on. Thus, based on this approach, one would not expect to see gender differences in job satisfaction for professional men and women such as engineers, as they would be in similar structural locations.

A third theoretical approach is Grusky's (1966) overcoming barriers argument. Grusky's model addresses the limits of socialization theories that are too focused on an individual or a structural approach which looks only at a current context and not difficulties in surmounting barriers that women in engineering have often been described as facing on an everyday basis. While his theory focuses on organizational commitment, the application of his model to the analysis of job satisfaction is also appropriate. Organizational commitment and job satisfaction are strongly and positively correlated and in application to engineering allow a relevant theorization. According to his theory, the strength of a person's organizational commitment is influenced by the reward the individual has received from the system and the kinds of experiences this individual has had to undergo in order to receive the rewards. The greater the obstacles the person has to overcome to obtain the organization's rewards, the greater the

commitment. Moreover, the person who has overcome obstacles in achieving desired rewards from an organization compares him or herself with a person of an equal status who did not do so. Applied to engineering and based on existing evidence of women's challenges in entering and remaining in the occupation, women who managed to obtain engineering jobs would have a higher organizational commitment and greater job satisfaction than men. Moreover, once women have overcome these obstacles and are working in engineering, they would compare themselves to men who might have faced fewer challenges than the women entering the occupation, while receiving higher organizational rewards than the women. Consequently, having been accepted into engineering, as they desired, when making such comparisons women would feel less satisfied with their pay but also feel less overqualified, because of their high level of organizational commitment and job satisfaction.

Hypotheses

In order to assess these competing theories, we propose the following hypotheses. First, if socialization theory is correct, then:

[H1a] Men and women will differ in their degree of job satisfaction, regardless of the job characteristics, with women being more satisfied than men, and

[H1b] women will value different aspects of jobs than men.

[H1c] Being married or having children will have a negative impact on job satisfaction for women but not men.

Secondly, if the structural hypothesis is correct then,

[H2a] if women engineers experience fewer rewards in their jobs than men engineers, then women will experience lower levels of job satisfaction than men, and

[H2b] family would have a similar impact on men's and women's job satisfaction.

Finally, if Grusky's overcoming barriers model is correct, then,

> [H3] women will demonstrate higher levels of job satisfaction than men regardless of any of their job or individual characteristics, by virtue of having had to overcome more to get where they are –in engineering jobs.

Methodology

Sample

To assess these hypotheses, I use the Canadian National Graduates Survey 2013 (Statistics Canada, 2013), a sample of 28,500 graduates from Canadian public universities, community colleges and trade/vocational programs, four years after their graduation in 2010. The survey's primary objective was to obtain information about labour market experiences focusing on employment, occupations and the relation between jobs and education. The data were collected between April to September 2013, using a computer-assisted telephone interview (CATI). My analysis was conducted within the restricted environment of the Research Data Centres and was limited to graduates from BEng university programs who were employed in Canada at the time of the survey. After carrying out list-wise deletion, the final sample size was 4,236 individuals, of whom 86% were men and 14% were women.

Measures

The dependent variable for the study is job satisfaction, which was recoded from a five-point Likert scale of very satisfied to very dissatisfied into a dichotomous variable (very satisfied or somewhat satisfied = 1; neither dissatisfied nor satisfied, somewhat dissatisfied, or very dissatisfied = 0). This recoding was needed to address low cell numbers in the variable categories "somewhat satisfied," "neither dissatisfied nor satisfied," and "somewhat dissatisfied."

The main independent variable of the study is gender, measured as 0 for men and 1 for women. To assess the theories' explanations of gender differences in job satisfaction, we included items on three dimensions: (1) graduates' objective job characteristics, (2) their subjective feelings about these job characteristics, and (3) measures of individual and family characteristics. All the items, except for working hours, were recoded as dichotomies. First, graduates' objective job characteristics were measured with four items: job's relevance to engineering (1 for relevant to engineering; 0 for non-engineering job); job permanency (1 for full-year permanent job; 0 for contract, seasonal, or part-year job); working hours were transformed using a natural log function; and supervisory status was included to measure career advancement (1 for respondents who are supervisors; 0 for those who are not).

Subjective feelings about the job included measures of satisfaction with pay (1 for satisfied or very satisfied, 0 for less than satisfied); feeling overqualified for a job (1 for those who felt overqualified and 0 for those did not). Finally, personal and family characteristics included ethnicity (1 for members of a visible minority and 0 for not), marital status (1 for married or common-law; 0 for single, never married, divorced, widowed, or other), and parental status (1 for has at least one child; 0 for childless). Given the cohort studies, any children are likely to be young.

Method

To assess our hypotheses, we first calculated descriptive statistics split by gender with tests of significance between the two groups. We followed this with logistic regression analysis to allow us to identify statistically significant factors that predict job satisfaction for BEng graduates, while holding constant potential important covariates. To aid in the interpretation of

our results, we also calculated a series of predicted probabilities based on the results of the logistic regression analyses.

Logistic regression was the appropriate method to use considering the binary nature of the dependent variable job satisfaction. The use of OLS was not possible as a dichotomous dependent variable would violate the linearity assumption and results in a large estimation error (Long and Freese, 2014). All of the measures of objective, subjective, and family characteristics were included in one logistic regression model predicting job satisfaction, using the survey methodology command in the statistical software STATA. The survey methodology mode adjusts for the complex survey design in order for estimates to be representative of the target population. The survey methodology mode allows for the avoidance of biased estimators, inaccurately shrunk standard errors due to blown up population numbers and other errors that would lead to an inaccurate estimation of data.

While many existing studies use odds ratios to interpret their results, these interpretations are often confusing and difficult to understand, and cannot be used for comparisons across models with different variables (Mood, 2010). For clearer interpretation of our results, we followed the recommendation of Mood (2010) by calculating predicted probabilities based on the log odds coefficients from the logistic model. Predicted probabilities are probabilities of a particular outcome happening when setting each of the independent variables to a hypothetical level, typically the mean for interval variables or a 1 or 0 for dichotomous independent variables to compare groups. The higher the value, the more likely the chance of a predicted event (of being satisfied with job) happening.

Results

As in, the existing empirical evidence (Bokemeier & Lacy, 1987; Jagacinski, 1987), these descriptive statistics indicate that women have higher rates of job satisfaction than men among Canadian engineers in their first three years on the job (see Table 4). Specifically, 89 percent of men and 98 percent of women are satisfied with the jobs that they held three years after graduation from a Canadian BEng program, which is a statistically significant difference at the $p<0.01$ level. This finding supports our [H1a] hypothesis that predicted women being more satisfied than men.

Table 4. Descriptive statistics, by gender (NGS 2013)

	Men	**Women**
Dependant variable		
Satisfied with job	89%**	98%
Objective Job Characteristics		
Job is closely related to engineering (requires BEng degree)	67%	69%
Job is permanent	92%	94%
Supervised someone in job	43%+	29%
Average working hours per week	40	39
Subjective feelings about Job		
Feel Overqualified for job	20%+	12%
Feel satisfied with money made at job	86%+	79%
Control Variables		
Visible Minority Group Member	27%	20%
Married	38%**	54%
Parent	12%	15%
Total	86%	14%
N	3721	605

*Note: Results are weighted; + p≤ 0.10; * p ≤ 0.05; ** p ≤ 0.01; *** p≤ 0.001*

However, the only other statistically significant gender difference at the $p<0.01$ level in the analysis was found in rates of marriage, with more women (54%) than men (38%) reporting being married ($p<0.001$). No other differences in proportions were statistically significantly different at the $p<0.05$ level, although there were some marginally significant differences at the

p<0.10 level. For example, more men (20%) felt overqualified for their jobs in comparison to women (12%); more men (86%) than women (79%) were satisfied with the money they earned at their jobs; and more men (43%) than women (29%) supervised someone in their job. These findings offer support to the idea in our [H2a] hypothesis that predicted fewer job rewards for women in comparison to men. Even smaller differences were noted for the proportion of women versus men working in engineering-related jobs (69% vs 67%, respectively) and in permanent positions (94% vs 92%, respectively).

Overall, the descriptive statistics suggest that among these early career engineers, women are more likely to be satisfied with their jobs than men, although they are relatively similar in terms of their objective and subjective job characteristics as well as their individual and family statuses. Nonetheless, given the gender differences in the sample and across the literature on the various independent variables, we estimated a logistic regression model to examine whether these factors affect the gender-based gap in job satisfaction.

Table 5. Logistic regression estimates predicting job satisfaction (NGS 2013)

	Full Model Log Odds
Women	2.648***
	(0.849)
Objective Job Characteristics	
Job is closely related to engineering	1.376***
	(0.630)
Job is permanent	1.456***
	(0.533)
Supervised someone in a job	1.297***
	(0.638)
Working hours (natural log)	-0.908
	(-0.493)
Subjective feelings about Job	
Feel Overqualified	-2.098***
	(0.536)

Satisfied with money	2.396***
	(0.574)
Visible Minority group member	0.626
	(-0.605)
Married	-0.066
	(-0.597)
Parent	0.583
	(-0.788)
constant	2.246
	(-1.626)
N	4326

Note: Results are weighted; (standard errors are in parenthesis); ** p ≤ 0.05; ** p ≤ 0.01;*** p≤ 0.001.*

The results presented in Table 5 suggest that gender, the objective job characteristics of job relevance to engineering and supervisory status, and the subjective feeling of being overqualified for job and satisfied with job pay are all statistically significant (p<.001) predictors of job satisfaction for BEng graduates about the job held three years after graduation. Specifically, women are significantly more likely than men to be satisfied with their jobs. In fact, gender is the most significant predictor of job satisfaction. Job permanence, relevance to engineering and supervisory status are all significant and positive predictors of job satisfaction for these graduates. In terms of subjective feelings, as expected based on the relevant literature, the feeling of being overqualified is a significant and a negative predictor of job satisfaction for women (Amelink & Creamer, 2010). Feeling satisfied with money is the significant, positive and strongest (coefficient 2.396 significant at p<0.001 level) out of all tested job predictors of job satisfaction (Bender et al., 2005).

Next, we estimated the predicted probabilities based on the coefficients obtained in the model through a series of hypothetical accounts of specific cases, split by gender (see Table 6). The lower the percentages of these probabilities, the lower the probability that the person in that scenario would be satisfied with their job.

Table 6. Predicted probabilities of being satisfied with job, by gender (NGS, 2013)

	Men	Women
Hypothetically "Good" Job		
Job is in engineering, permanent, and provides a satisfying amount of money, all else 0 or mean	98.6%	99.9%
Hypothetically "Bad" Jobs		
Job is NOT closely related to engineering, all else 0 or mean	80%	73%
Job is NOT permanent, all else 0 or mean	66%***	90%
Supervised NO ONE at a job, all else 0 or mean	83%	97%
LONGER than average working hours per week, all else 0	75%	65%
Feel overqualified at the job, all else 0 or mean	60%***	92%
NOT satisfied with money at job, all else 0 or mean	55%***	95%
Personal and Family Characteristics		
Married with at least one child, all else 0 or mean	89%	97.9%

*Note: Results are weighted; *p ≤ 0.05; ** p ≤ 0.01;*** p≤ 0.001.*

The results in Table 6 in the section "Hypothetical 'Good' Job" are predicted probabilities that are calculated separately for men and women who are "white," that is not members of a "visible minority," single and without children and who worked an average 40 hours per week (the majority of the sample), in engineering jobs that are permanent, and were satisfied with their pay. Although there is a gender difference in job satisfaction, when comparing men and women in hypothetically "good" jobs, we can see that the difference between women (99.9%) and men (98.6%) is very small.

This result shows support for the structural hypothesis. It is differences in the structural characteristics that explain why men and women generally might have different levels of job satisfaction. The socialization arguments do not explain why there are differences in job characteristics; when men and women have the same "good" characteristics, both are almost 100% satisfied with their jobs.

To test our [H1b] hypothesis that predicts women would value different aspects of jobs than men, we estimated predicted probabilities for each objective job characteristic separately for men and women who were single, childless, white, combined with 1) working in jobs not relevant to engineering; 2) working in non-permanent jobs; 3) not supervising anyone; 4) longer than average working hours; 5) feeling overqualified; 6) dissatisfied with pay. In each case there was a score of zero on all the other job-related independent variables. The predicted probabilities in Table 6 clearly show that there are differences in what predicts men's and women's job satisfaction. Overall, for women being in a job unrelated to engineering depresses their job satisfaction the most in comparison to men. For example, in the section "Objective 'Bad' Job Characteristics," men were predicted to have an 80% chance of being satisfied with their jobs when the job is not in engineering, compared to equivalent women, who would be predicted to have a 73% chance of being satisfied with such jobs. Furthermore, for men, feeling overqualified (60% chance of being satisfied), dissatisfied with money (55% chance of being satisfied), and being in a non-permanent job (66% chance of being satisfied) are the factors which most depress their job satisfaction.

The last section in Table 6 predicted the probabilities for "white" men and women who worked in permanent engineering jobs with satisfying pay and an average work week of 40 hours, who were married and had at least one child. These probabilities demonstrated that the chance of being satisfied with their jobs is again higher for women than for men. We suggest that family and childcare responsibilities do not have a negative effect on overall job satisfaction of women BEng graduates working in engineering jobs. Therefore, we did not find support for our [H1c] hypothesis that predicted more negative effects of child and family responsibilities for women than for men. However, considering the overall results, we argue for the support of our

[H3] hypothesis that predicted women's higher level of job satisfaction regardless of their objective job characteristics; having cancelled out the other choices, their higher job satisfaction may be due to their having overcome a number of barriers to their participation and career development in the occupation.

Conclusion

This analysis shows that women are more likely to be satisfied with their engineering jobs than men. The study pointed out on gender differences in the aspects that shape men and women's overall job satisfaction in engineering. For example, women working in engineering jobs place greater importance on belonging to engineering than do men. Satisfaction with pay and being in a managerial position has less effect on women's overall job satisfaction than men's. Family responsibilities have no statistically significant effect on either men's or women's job satisfaction. Based on these results, we argue that women are more satisfied with engineering jobs than men because of their genuine interest in working in engineering and due to the experiences in educational and the workplaces that have often been described in the existing literature as challenging (Ranson, 2005; Stone, 2007). Women who get into engineering after overcoming challenges in educational programs and workplaces may be very satisfied with their job, as they might feel pride in belonging to this prestigious occupation. However, this emphasis on belonging to engineering might impede women's ability to question inequalities in pay and career development.

While this study's results provide some insights about factors affecting engineers' job satisfaction, they cannot be generalized to the overall engineering workforce in Canada since the study focused only on engineers at an early stage in their careers and from a variety of engineering branches. Moreover, other aspects of engineering workplaces such as size of the

organization, flexible work hours, or mentorship programs were not taken into account, and these might be influential on overall job satisfaction, and also contribute to further gender-based differences. Future research should include these factors and factors that shape men's and women's everyday experiences in engineering such as job duties, everyday workplace interactions, managerial support, and human resources policies in the context of present economic conditions. There is also a need for a future research focusing on women who persevere even further in engineering, as this study suggests that these women might be different from those who left from engineering.

In regards to policy implications, given the finding that women working in engineering are most satisfied because their work is related to their professional training, then employing more women in such jobs will contribute to diversity and innovation in the technological sector. Consequently, policies leading to the elimination of gender bias and stereotypes in engineering organizations and occupations would be beneficial for women starting their careers in engineering and would both facilitate their retention in the occupation and result in economic growth for Canada.

Chapter 4. Gender Differences in Organizational Commitment among Early Career[8] Engineers in Canada.

Introduction

Engineering is a male-dominated occupation (Bystydzienski, 2009) despite an unprecedented influx of women entering university engineering programs in recent decades (O'Donnell et al., 2005). Many engineering organizations in the Western world, however, struggle to retain women in their workforce (Hill et al., 2010; Robelen, 2010). The existing literature shows that employed women were more likely than men to be looking for and finding jobs with another employer and in some cases outside of engineering, especially early in their careers (Bennett et al., 2011). Some argue that this is because women are opting out from their jobs to fulfill their family obligations (Stone, 2008; Howe-Walsh & Turnbull, 2016), although others contend these women are being pushed out of a male dominated culture in engineering that is hostile to women (Evetts, 2014). While women's underrepresentation in the occupation persists, recent studies analyzing the factors affecting women's decisions to look for another job are absent from the Canadian sociological literature and scarce in the international literature.

The present study addresses this gap by investigating whether there are gender differences in the intention to look for a job with another employer among engineers at their early career stages and, if so, how we can explain them. Drawing on organizational commitment theories, using logistic regression, we analysed the most recent data from the National Graduates Survey (NGS) 2013 (Statistics Canada, 2013) for 3,236 Canadian BEng graduates who worked in engineering jobs three years after graduation. The results of this study have

[8] This chapter has been submitted to for publication and currently is under review Canadian Journal of Sociology

important implications for understanding if there are gender specific reasons for why women would leave a field in which they are significantly underrepresented.

Literature Review

Organizational commitment (OC) is understood as a *psychological* attachment of workers to organizations (Porter et al., 1974). OC can be characterized by at least three factors: a strong belief in and acceptance of the organization's goals and values; willingness to exert a considerable effort on behalf of the organization, and a strong desire to maintain membership in the organization. OC is strongly and positively correlated with job satisfaction (Gunlu et al, 2010) and is a strong predictor of voluntary turnover. Tolentino (2013) linked OC to employees' performance, suggesting that highly committed employees may perform better than less committed ones.

The interest in OC has continued to be strong in recent decades due to changes from an industrial to a knowledge economy that has led to massive layoffs, outsourcing, and the replacement of "jobs for life" with contractual, insecure employment, long working hours, and limited career opportunities (Benson & Brown, 2011; Ferguson & Wang, 2014; Mowday et al., 2013). According to Lee and Galpin (2010), these organizational shifts towards "lean" organizations have had a negative impact on employees' OC, despite a continued need by these organizations to retain talented and productive workers (Lowe et al., 2011).

While changes in contemporary organizations have modified ways of working, the new generation of employees (born in or after 1980) has been shown to have values and an understanding of work and commitment that are different from previous generations. Ng et al. (2010), who investigated the career expectations of "millennials" (born in or after 1980) found that while this generation has realistic expectations about their first job and salary, they place the

greatest importance on individualistic aspects of the job, seeking rapid advancement and development of new skills in their careers and while also ensuring a meaningful and satisfying life outside of work. Chirumbolo and Hellgren (2003) and Martínez-León et al (2018) analyzed the effect of personal and job characteristics (Burke & Ng, 2006; Cennamo & Gardner, 2008) on employees' affective feelings towards their jobs and its characteristics. Sigalit & Pines (2008) and Jenkins (2009) analyzed the effect of work-life conflict on employees' OC. The results showed that, in general, for employees with university degrees, job and pay satisfaction and career opportunities are strong and positive predictors of OC. In contrast, non-permanent jobs, jobs where employees feel overqualified, and work longer than average working hours are jobs towards which employees have lower than average level of OC.

With this generational shift in workers, has also come an increase in women's participation in the labour force, without an equivalent shift in their disproportional family responsibilities, relative to men. These changes have led to growing interest in how gender is related to organizational commitment. Early studies such as Grusky (1966), who studied government managers' OC, suggested that women as a group were more committed than men, in part because they had to surmount greater barriers than men to achieve in a male-dominated workforce. Later studies revealed that men had a stronger OC than women (Suki et al., 2010; Jena, 2015), while Dagic (2014) found no gender-based differences in a meta-analysis of 33 studies. In contrast, Aydin's et al. (2012) meta-analysis of 15 graduate theses between 2005 and 2009 on teachers' OC showed distinctions between males and females in terms of the nature of OC. Males' OC was stronger than females' in relation to organizational values and norms, whereas females' OC was stronger than male's in terms of the belonging and loyalty. Those who

find differences in organizational commitment, tend to offer two main explanations: gender differences in family obligations and gender differences in job characteristics.

Akintayo (2010) studied the impact of work-family conflict on organizational commitment of 247 industrial workers and found significant differences in the level of OC between men and women based on their family responsibilities and single versus married workers. His study showed family obligations and marital status are important predictors of OC and vary based on gender. The competing commitments between family and work, according to his study, resulted in a lower level of women's OC in comparison to men is. Casper et al. (2002), however, found no meaningful impact of work interference with family or family interference with work had on women's OC in their analysis of 143 professional employed mothers with at least one preschool-age child.

Wallace (1995) suggested that family responsibilities might modify the level of OC due to conflict between work and family because the attachment to one collectivity competes with that of another. Therefore, people who have extensive ties to groups other than their employer may have lower levels of OC. Women are more likely than men to have those ties because they are the primary caregivers and/or single parents more often than men. Therefore, the competing affiliations would suggest lower commitment levels among women. In contrast, Gerson (1985) argues that a woman's choice to commit to a career in a workplace as a distinct from "domestic" pathway is strongly affected by expanded or blocked workplace opportunities in her early years of employment. Thus, if women have satisfying experiences in the workforce, their OC would be higher than average and vice versa. In other words, the influence of family may actually be the result of one's job characteristics.

However, Risman (2004) argues that gender difference based on personal characteristics

can be explained by conceptualizing gender as a social structure that is embedded in the individual, interactional, and institutional dimensions of our society, rather than just within the individual. According to this argument, the nature of work shapes behavior through the structure of rewards, resulting in men and women responding similarly in the same occupational environment. Moreover, Lacy et al. (1983) suggest that men and women in a given occupation will exhibit the same priorities on a wide range of occupational attributes (e.g. money, advancement). Thus, based on this approach, one would expect to find no gender differences in OC for professionals such as engineers, as they would be in similar structural locations.

There is ample evidence showing that OC increases in jobs with better working conditions. For instance, many organizations have introduced flexible working hours (Wilthagen and Tros, 2004). Yadav et al. (2017), however, argue that in some cases these flexible arrangements lead to longer than average working hours. White et al. (2003) analyzed OC of professionals in the UK, and found that "high-performance" practices associated with longer than average working hours were a constant source of negative job-to-home spillover resulting in conflict between work-life responsibilities and low level of OC for both men and women regardless of their occupation (Bültmann, 2012).

Some therefore suggest that apparent gender differences are a result not of differences between men and women, but of differences in job characteristics within a highly sex-segregated labour market (Bielby & Baron's 1986), where women are in jobs with fewer job characteristics associated with high levels of OC (De Wittie 2003; Kerse et al. 2018). For example, in their meta-analysis of 133 studies Cheng & Chan (2008) found an equal negative effect of non-permanent/insecure jobs, on men's and women's OC across occupations and levels of education. Further, managers and supervisors have been found to have higher than average level of

commitment to their organizations (Brown, 1969; Moon & Choi, 2017) but women are less likely to be in these positions. Job satisfaction and satisfaction with pay are also strong positive predictors of OC, regardless of gender (Gunlu et al., 2010; Singh & Loncar 2010). Vandenberghe & Tremblay (2008) found no gender differences in OC in their analysis of the role of pay satisfaction on OC and turnover intent among 531 pharmaceutical companies' medical representatives.

However, early studies (Major et al., 1984; Hodson, 1989) showed that managerial and supervisory roles are more important for men than women in predicting their OC but that women managers have higher levels of OC than do men (Xu, 2008). Although in contrast, Stone (2008) argues that women who are managers are more likely to quit their jobs, due to greater levels of stress due to scrutiny and criticism from male colleagues and work-family conflict. Assessing gender differences among men and women located in similar jobs is therefore useful to determine whether any observed differences in labour market behaviour is a result of the workers' characteristics or the jobs themselves.

Gender differences in OC for Engineers

In the past twenty years engineering organizations have undergone significant restructuring through outsourcing and downsizing of production (Herzenberg et al., 2000) resulting in a shortage of engineering jobs in Western countries (Bidanda et al., 2006). However, despite these changes many engineering companies have introduced initiatives such as flexible working hours working from alternative places and time policies and mentorship programs to attract and retain women engineers (Rosser, 2003) as gender diversity has been linked to increase in profit. Research has shown significant gender differences in most aspects of men's and women's experiences in engineering (Niemeier & Smith, 2005; Xu, 2008; Franzway et al.,

2009). Women engineers have been shown to earn significantly less and to be less likely to work in managerial and supervisory jobs (Powell et al., 2012), and more likely to experience parenthood penalties (Lips & Lawson, 2009) and sexual harassment (Powell & Sang, 2015) than men. These experiences have been linked to women's job dissatisfaction with and intent to look for a job with another employer or outside of engineering (Hill et al., 2010). Further, multiple studies have shown that when women engineers feel overqualified for the jobs they do, they are likely to look for jobs elsewhere (Ayre et al.2013; Cech & Blair-Loy 2010; Franzway et al. 2009). Although satisfaction with pay has been identified as another determining factor of engineers' job satisfaction and organizational commitment (Watson & Meiksins, 1991) and women in engineering have been shown to be paid less than men most of the time (Cech, 2013), some studies have shown these differences are not significant and have no impact on women's organizational commitment (Walters, 2004).

Others, such as Ceci & Williams (2011), suggest that discrimination is now a phenomenon of the past that should now be discarded as an explanation for the persistent lack of women in engineering. For example, based on their review of 20 years of empirical research they found more than one study showing that women with PhDs in engineering get hired before men at the university level. As such, they suggest that women's underrepresentation is caused by women's preferences and fertility intentions, "both free and constrained" (Ceci & Williams 2011, p. 3161). Similarly, Buchmann & McDaniel (2016) identified family responsibilities as one of the main reasons for women leaving engineering jobs.

All in all based on the reviewed literature, we would expect that for "millennial" BEng graduates their personal and job characteristics would be significant predictors of OC. In particular, we expect women's OC to be equal to men's due to recent retention and career

development initiatives in engineering organizations in Canada (Allen, 2001). These initiatives promise satisfying workplace experiences for these women and, therefore, might have a positive effect on their OC reducing the probability of their looking for a job with another employer. In cases when BEng women feel overqualified for their jobs, we expect that they would be more likely than men to look for another job. Family obligations might reduce women's OC in comparison to men's due to their primary caregivers roles (Armstrong & Armstrong, 2010).

Methodology

Sample

To assess these competing arguments, we use the NGS 2013 (Statistics Canada 2013), which contains information of 28,500 graduates from Canadian public universities, community colleges and trade/vocational programs, who were surveyed three years after their graduation in 2009/2010. The survey's primary objective was to obtain information about labour market experiences focusing on employment, occupations and the relationship between jobs and education. The data were collected between April and September 2013, using a computer-assisted telephone interview (CATI). This study analyzed the restricted use data at the Ontario Research Data Centres and was limited to graduates from BEng programs who were employed in Canada at the time of the survey in engineering jobs. After carrying out list-wise deletion, the final sample size was 3,236 individuals of whom 86% were men and 14% were women.

Measures

The dependent variable for the study is a binary measure asking if the respondent is "looking for a job with another employer" (1 = yes / 0 = no). Existing literature by Steer (1977) on OC suggests that individuals who look for a job with another employer are unlikely to be

committed to their current organization. The main independent variable of the study is gender, measured as 0 for men and 1 for women.

To assess explanations for gender differences in intent to look for a job with another employer, we included items in three categories: (1) graduates' job characteristics, (2) measures of their personal characteristics and (3) control measures of their feelings about these job characteristics and their visible minority status. Graduates' job characteristics were (a) job permanency (1 for full-year permanent job; 0 for contract, seasonal, or part-year job); (b) working hours were transformed using the natural log function; (c) and supervisory status (1 for respondents who are supervisors; 0 for those who are not).The personal characteristics were marital status (1 for married or common-law; 0 for single, never married, divorced, widowed, or other), and parental status (1 for has at least one child; 0 for has no children). The control variables were job and pay satisfactions, feeling overqualified and visible minority status. Job satisfaction was recoded from a five-item Likert scale of very satisfied to very dissatisfied into a dichotomous variable to address low cell numbers in the variable categories "somewhat satisfied", "neither dissatisfied nor satisfied," and "somewhat dissatisfied" (very satisfied or somewhat satisfied=1; neither dissatisfied nor satisfied, somewhat dissatisfied, or very dissatisfied =0). Satisfaction with pay was coded (1 for satisfied or very satisfied, 0 for less than satisfied) and feeling over qualified for a job (1 for those who felt overqualified and 0 for those did not). Visible minority was coded (1 for members of a visible minority and 0 for not belonging to a visible minority group). We included measures of visible minority status in the model as a control variable because existing literature on the topic suggests that visible minority graduates, especially women, would be more likely to look for a job with another employer than

any other graduates because of the sexual and racial harassment that has been documented for example Powell and Sang (2015) in engineering workplaces .

Method

There are two methods in the analysis: (1) descriptive statistics with t-tests to assess statistical significance in differences between men and women on all variables, followed by (2) binary logistic regression to identify factors predicting the BEng graduates' OC while addressing the dichotomous nature of the dependent variable. All of the measures of job and personal characteristics and the control variables were included in one model predicting probability of looking for a job with another employer. We utilized the survey methodology command in the statistical software STATA to adjust for the complex survey design in order for estimates to be representative of the target population. We then followed Mood's (2010) recommendation to calculate predicted probabilities, to improve the interpretability of the logistic regression coefficients. Using STATA's "predict" commands, we calculated the probability that men and women will say they want to quit given various hypothetical situations in the independent variables, setting all other values of the independent variables to the mean for dummy variables. The predicted probabilities allow to compare the effect of gender across groups by setting all other variables to their means using the STATA software dialog box. The significance in differences of these probabilities is calculated by the STATA software and indicated in the output from the "predict" command.

Results

The descriptive statistics indicate that there is no gender difference in the intent to look for a job with another employer among BEng graduates who were working in engineering jobs in the three years after the graduation (see Table 7). Although in the sample 15 percent of men and

4 percent of women were looking for another job, this difference is not statistically significant at the $p<0.05$ level.

Table 7. Descriptive statistics gender comparison for men and women who graduated from BEng programs and were working in engineering jobs three years after the graduation (NGS 2013)

	Male	Female
Looking for a job with another employer	15%	4%
Job Characteristics		
Job Permanent	96%	96%
Working hours per week	40	39
Supervised someone at a job	51%***	30%
Personal Characteristics		
Married	42%	54%
Parent	14%	18%
Control Variables		
Satisfied with the job	97%	99%
Satisfied with money made	92%	80%
Feel Overqualified	9%	2%
Visible minority	20%	3%
N=3,236	86%	14%

*Note: Results are weighted; * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$*

The only statistically significant difference between men and women in the sample is in the proportion of supervisors; significantly more men than women were supervisors in their engineering jobs ($p <0.001$). However, the proportion of women and men who worked in permanent jobs did not differ and we also found no gender difference in the duration of working hours (40 hours men and 39 for women). In terms of the variables that measured personal characteristics of graduates, there were also non-significant differences in the proportion of graduates based on gender. More women than men were married (54% vs 42% respectively) and had children (18% vs. 14% respectively), but fewer were visible minorities (3% and 20% respectively). The descriptive analysis of respondents' feelings about their jobs also shows no

gender differences. Almost all the women in the sample (99%) were satisfied with their jobs, as were 97% of the men. More men (92%) in comparison with women (80%) were satisfied with the money they earned, and more men felt overqualified (9%) in comparison to women (2%).

The results presented in Table 8 show that gender does not have a significant impact on the likelihood of seeking a job with a different employer for BEng graduates at the $p<0.05$ level. The only significant predictors of job search intentions are visible minority status and pay satisfaction. Visible minority status increases and pay satisfaction decreases the likelihood of looking for a job with another employer when all other variables are kept constant, which is significant at the $p<0.001$ level.

Table 8. Logistic regression log odds predicting whether the respondent was looking for a new job with another employer (NGS 2013)

	Log Odds (St. Err)
Women	1.541
	(-0.814)
Job Characteristics	
Job Permanent	1.555
	(-1.136)
Working hours (natural log)	0.362
	(-0.543)
Supervised someone in a job	1.320
	(-0.577)
Personal Characteristics	
Married	0.772
	(-0.348)
Parent	1.515
	(-0.929)
Control Variables	
Satisfied with the job	0.064
	(-0.094)
Satisfied with pay	0.209***
	(0.135)
Feel Overqualified	0.584
	(-0.341)
Visible Minority group member	3.668***
	(1.715)
N	3326

*Note: Results are weighted; (standard errors are in parenthesis) ; *p ≤ 0.05; ** p ≤ 0.01;*** p≤ 0.001*

Overall, we do not see clear evidence that men and women differ in their job or family characteristics enough to impact the predicted likelihood of looking for other jobs directly. However, to assess whether there are gender differences in the impact of these factors on the likelihood of seeking a job with a new employer and to facilitate the interpretation of our results, we estimated predicted probabilities for men and women, based on the results of the logistic regression results.

Table 9. Predicted probabilities of looking for a job with another employer for BEng degree holders from their jobs they held in three years after the graduation split by gender (NGS, 2013)

	Men	Women
Looking for a job with another employer, all else 0 or mean	18%	24%
Family characteristics predictors		
Parent, all else 0 or mean	15%***	30%
Married, all else 0 or mean	14%	18%
Job characteristics predictors		
Supervised, all else 0 or mean	18%***	35%
Control Variables predictors		
Feeling overqualified, all else 0 or mean	21%***	58%
Visible minority, all else 0 or mean	34%***	55%
Multiple predictors		
Satisfied with the job, with pay, and working an average of 40 hours per week – for **white graduates**	15%	17%
Satisfied with the job, with pay, and working an average of 40 hours per week - for **visible minority graduates**	34%***	55%
Satisfied with the job, with pay, in **supervisory roles** and working an average 40 hours per week	13%***	24%
Satisfied with the job, with pay, and working an average of 40 hours per week- for **married graduates with child(ren)**	18%***	45%

*Note: Results are weighted; *p ≤ 0.05; ** p ≤ 0.01;*** p≤ 0.001*

As shown in Table 9 the predicted probability for women to look for another job is 24% compared to 18% for men, net of all other factors. As shown in Table 8 however, this difference is not statistically significant. Being a parent increases significantly probability of looking for

another job for women (30% chance) in comparison to men (15% chance). Working in supervisory roles affects women's chances (35%) of looking for another job significantly more than it does men's (18%). These results perhaps support Stone's (2008) argument regarding a high level of stress for women in managerial positions; however, we had no means of testing this. For women, feeling overqualified for a job has the strongest effect on intent to look for another job (58%) of all the predictors tested in this study in comparison to men's (21%) chance. For visible minority women and men, the predicted chances of looking for another job are 34% for men and 55% for women. These results are consistent with existing literature suggesting lower than average level of OC among visible minority employees, with the lower OC attributed likely to racism, combined with sexism for women, in the workplace (Powell & Sang, 2015; Gibson & Espino, 2016).

To facilitate the understanding of our results further, we calculated probabilities for BEng graduates of looking for another job with a different employer while controlling for satisfaction with job and pay and having average working hours. We looked at four hypothetical situations: when graduates were white, visible minorities, supervisors, and married parents. These situations have been selected because an interaction term between gender and visible minority status was significant in a separate analysis. Moreover, marital and parental statuses reflect common explanations for what might lead to increased turnover intentions of women. And, supervisory status was the only significant difference between men and women in the sample.

From the Multiple Predictors section of Table 9 we see that the chances of looking for another job are not statistically significant for male and female *white* graduates (15% for men and 17% for women) but there were significant differences between male and female visible minority graduates. Similarly, there were gender differences in likelihood of seeking a job

among supervisors and between married parents, which were statistically different at the $p<0.001$ level. Additionally, we can see that there is a higher chance that visible minority men will be looking for a job with another employer in comparison to white men. In contrast, for white men, working the supervisory role reduced their chances of looking for another job. Men with children had no difference in their intent to work somewhere else compared with men on average, however, women with children had a much higher probability of seeking a job compared with women on average.

Conclusion

This study has shown no gender differences in intention to look for a job with another employer between men and women with BEng degrees. However, although women are as committed to their organizations as men on average, when they are a visible minority, a parent, feel overqualified or are in a supervisory position, they are more likely than men to look for a job with another employer. While we do not have any means to measure why this is the case, we can suggest that these factors perhaps are a result of existing findings about sex and race discrimination in engineering (Quinn, 2002; Hill et al., 2010; Hall et al., 2015). Past research shows that women disproportionally to men exit the occupation despite the fact that they enter the occupation relatively quickly and are satisfied with their jobs; therefore, more research is needed to look at everyday interactions in engineering workplaces to understand better the effect of these interactions on women's decision to look for jobs elsewhere. Our analysis could not capture the fine details of women's experiences in the engineering workplace, they pointed out that being a visible minority, a parent, feeling overqualified, and in managerial roles are factors that might increase women's probability to look for another job. Consequently, studies that examine the engineering workplace culture (e.g. everyday conversations, human resources

practices) are needed to determine how to create an inclusive and productive workplace environment for all engineers regardless of their gender and race.

Our study is not without limitations. One of the main limitations of this study is that we do not measure the types of other jobs these graduates were looking for. Therefore, we cannot say conclusively that the factors we identify as increasing women's chances of looking for a job with another employer would lead to women leaving the occupation entirely. Another limitation is in the very small sample of women (4%) seeking other jobs, which may explain the weak power to draw conclusions about this population. This analysis shows the great need for better data on engineering graduates and engineers in Canada in order to examine the factors that shape their decision to look for a job somewhere else.

Chapter 5. Conclusion and Discussion

The purpose of this dissertation was to explore gender differences in the early career experiences of BEng graduates in Canada by examining their entry into the occupation, job satisfaction, and their probability of looking for another job, in three years after their graduation. This study contributes to the existing literature in its use of quantitative methods to identify how graduates' experiences are shaped by their gender. From previous studies, it is known that women with these degrees often do not enter the occupation, are dissatisfied with their jobs, and or leave the occupation shortly after starting to work, in what is sometimes referred to as a leaky pipeline (Ferguson, 2016). These leaks contribute to women's underrepresentation in the occupation, and represent a loss of talent, perspective, and might have negative economic consequences for the field (Blickenstaff, 2005).

The National Graduates Survey 2013 used in the analyses is the most recent data about graduates from public educational institutions produced by Statistics Canada. The survey contained information about 9,400 graduates from BEng programs across Canada who were representative of graduates from 42 engineering educational programs (see Appendix A for the full list of engineering programs included). Although most previous studies have focused on the women who do not stay (Blickenstaff, 2005; Syed & Chemers, 2011), with a particular emphasis on gender-based inequalities (Cech, 2013) and the barriers women have faced thwarting their success (Faulkner, 2007), this study focused on the successful cases—those who were looking for, found, and worked three years after graduating with a Bachelor's degree in engineering. Understanding these experiences is important because it can lead to recruiting and retaining more women engineers, adding new talent and resources to the occupation and creating a healthy, inclusive environment for all engineers regardless of their gender.

To arrive at an understanding of the gender differences in early career experiences, the study was directed by three main research questions:

1. Are there are gender differences in the duration of job search and types of jobs the graduates obtained after completion of BEng programs?
2. Are there gender differences in job satisfaction between men and women with BEng degrees who were employed in engineering jobs in the three years after graduation?
3. Are women less committed to engineering jobs than men, and if yes, what are the factors shaping women's organizational commitment?

To answer these questions, three samples were selected. For the first analysis, graduates who were actively seeking their first job after graduation from a BEng program were chosen. These graduates started their programs right after the completion of their high school diploma or equivalent and were taking their program full-time and completed their degrees without interruption. The analytic sample contained information about 2,856 individuals. The average age of these graduates was 25 years old for both men and women with the majority of them being single and childless. For the second analysis, we selected BEng graduates who were employed at the time of the survey in jobs relevant and not relevant to engineering. This analytic sample contained 4,326 graduates. In terms of the demographic characteristics of these graduates, both men and women were on average three years older in comparison to graduates in the first sample, and more women than men were married. For our final analysis, we only looked at the graduates who worked in engineering jobs. This analysis included 3,326 BEng graduates. The mean age of graduates at that time was 28 – 29 years old.

Major themes

The analyses revealed several major themes. The first analysis showed that women were finding engineering jobs sooner than men and that the types of jobs earned did not differ based on gender. The results of the second analysis demonstrated that women are more satisfied with their jobs than men; even though men are more likely to be supervisors than women. And the analysis of the intent to look for another job revealed no gender differences in such intent, but that gender-specific attributes such as marital and parental statuses and graduates' perception of the job characteristics are factors that shaped women's (but not men's) decisions to look for a job somewhere else. We also found that visible minority status increases chances for these graduates to look for another job. In other words, among graduates who made it, there is something to notice in terms of greater inclusion and gender diversity. Women are getting jobs faster than men, they are satisfied with their jobs when they get there, and they are unlikely to want to leave. However, we continue to see hints of inequities when it comes to the impact that parenthood has on women disproportionately and on the experiences of visible minorities.

Comparison of this study with the existing literature

As the literature review in the first empirical article reveals, in the context of the knowledge economy many aspects of the engineering workplace have changed (Benner, 2008). The changes have led to a shortage of engineering jobs and a prevalence of low paying, contract-based positions in the engineering labour market (OPSE, 2015). Engineering organizations have implemented a number of initiatives to attract and retain women (Adams et al., 2011), yet, women continue to be underrepresented and face pay (Cech, 2013) and career development inequalities (e.g. supervisory roles) . However, women were shown to be hired sooner than men and less likely than men and graduates from other fields to feel overqualified in their jobs as

supported by Sassler et al. (2017) study findings. While this study did not include measures of availability of engineering jobs or measures of engineering workplaces women's retention initiatives, it included in all three empirical articles measures of job permanency to reflect the change in engineering workplaces. While the first study revealed that women enter the occupation sooner than men and into equivalent jobs, this rapid entry into the occupation doesn't change the occupational gender landscape, as women continue represent a minority in the occupation, as the Engineers Canada 2017 report shows.

The literature reviewed in the second empirical article suggests that significant changes in objective job characteristics such as job permanency, job relevance to engineering, and flexible working arrangements have occurred over the past decades (Adams et al., 2011). Post et al. (2009) showed that men are more likely to feel overqualified than women and that this explains women's higher level of job satisfaction. However, the literature provided mixed results about gender differences in job satisfaction in engineering specifically (Martínez-León et al., 2018). My study supported the results of existing analyses that found no significant gender differences in types of jobs such as job relevance to engineering, permanence, working hours and supervisory status. The subjective feelings that were tested also showed that for both men and women feeling overqualified for a job and satisfaction with pay are important predictors of their job satisfaction. However, women who worked in jobs equivalent to men's were more satisfied than men, suggesting that women's disproportionate exit from engineering jobs is not likely due to their dissatisfaction with their jobs.

As reported in the third empirical article's literature review, women's intentions to leave their engineering jobs has been tied to gender differences in family responsibilities and the types of jobs these women do (Powell & Sang, 2015). Feelings of being overqualified for a job or

supervisory roles have been shown as the main predictors of women's intention to change jobs (Franzway et al., 2009). Many existing studies suggested that women are as committed to their jobs as men across a variety of occupations (Xu, 2008). The results of this third analysis provide support to the existing literature and show no gender differences in the intention to look for another job. The results also revealed that being a parent and working in a job where one feels overqualified increased women's chances to look for a job somewhere else more than for men. In particular, supervisory status increased women's probability of looking for another job, while it decreased men's. Another important finding of this third analysis is that visible minority status is a strong predictor of intent to leave. Taken as a whole, the results of the third analysis show that both men and women are equally committed to their organizations; however, women's family responsibilities, their supervisory status, and feelings of being overqualified, as well as visible minority status, increase their chance of looking for a job with another employer.

These findings echo the results of an as yet unpublished qualitative study conducted by the author under the supervision of NSERC - Pratt & Whitney Chair for Women in Science and Engineering (Ontario Region), to understand why women engineers do not advance well in a large industrial corporation in Canada. Eighteen semi-structured qualitative interviews were conducted with women engineers who varied in age, years of experience and seniority within the organization but had been identified by the organization as candidates for career advancement. The main finding of the study was that despite family-friendly provisions and other programs aimed at supporting women's career development, human resources practices rooted in gendered stereotypes and biases impact women emotionally and professionally, slowing down their career development. It was interesting to note, in this qualitative study, that the women interviewed showed a significant dissatisfaction with many aspects of their job experiences that were not

reflected in in-house employee surveys. In these surveys women tended to rate their job satisfaction as high. This finding could explain the higher proportion of women being satisfied with their engineering jobs described in this thesis.

Women in the study often referred to a "visibility-invisibility paradox" Faulkner (2009) as one of the reasons for their career stagnation, in which women are perceived invisible as engineers and visible as women. In interviews, they mentioned that in order to progress in their career they must participate in important projects to be "visible"; however, the majority of these women worked in customer service related departments and were unlikely to participate in important projects that would have showcased their engineering skills. Other aspects that were discussed in these qualitative interviews were the organizational culture and in-house mentorship program. These initiatives were implemented to facilitate women's career development. The analysis of the interviews on these topics pointed out differences in women's and men's experiences with the mentorship program, sexist remarks towards them in interactions, and gendered human resources practices (e.g., unannounced job opportunities, emphasis on hard to define soft skills) that impede women's career development.

All in all, the results of this qualitative study demonstrated that women's career development and intention to leave the organizations are to a large extent shaped by what has been described by Acker as "gendered organizational practices." These biased and stereotype-based organizational practices and workplace interactions contribute to women's underrepresentation in the occupation despite upper management interest and investment in women's career development, suggesting that gender defines experiences in the occupation.

The results of this dissertation also show that recent graduates' experiences were defined by their gender. Women were finding jobs similar to men's jobs sooner, and they were more

satisfied and committed to their engineering jobs than men; however, their minority and parental status as well as feelings of being overqualified or occupying managerial positions significantly increase women's probability to seek employment elsewhere. Taken as a whole, the results of this dissertation resemble Bielby & Baron's (1996) description of the revolving door phenomenon. The revolving door refers to the situation where women quickly enter the occupation and very quickly exit it without having a chance to stay and develop their careers; consequently, maintaining the status quo men's domination. Juxtaposing the results of this dissertation with those of the NSERC - Pratt & Whitney Canada Chair study suggests that gender defines women's experiences in the occupation in early and later career stages. While gender difference appears to be less determinative at the early career stages, at least in this study, these differences seem to be magnified later in women's careers and contribute to women's underrepresentation in the occupation. This information perhaps finesses our understanding of the dynamic of gender inequalities in the occupation and might help to develop policies that target the mechanisms creating inequalities which most likely exist in the engineering workplaces.

Future Research

While this analysis provides a broader picture of early career experiences in engineering, one limitation of this study is that only a small number of factors that have been included to assess the predictors of these early career experiences. This limitation is due to the data availability in the survey I used in the analysis. Future qualitative research is also needed to focus on how women experience everyday interactions in their workplaces, especially when they are supervisors and a visible minority. The sample might not be representative of all engineering graduates, particularly those who are part of a visible minority. Many cases that contain

information about these graduates were excluded from the analysis due to incomplete or missing data about these graduates. Considering that men play a significant role in engineering and that some of them might also struggle to develop their careers in the occupation, I would suggest that a comparative analysis of their experiences should be conducted. Interviews, inventories, and questionnaires should be prepared for them to determine their views and attitudes. This knowledge will enhance our understanding of how men and women work together in this occupation and why the mechanism of inequality continues to contribute to women's underrepresentation in the occupation. Another limitation that points to a need in future research is the composition of the samples, which treats a group of graduates from 42 engineering educational programs as a homogenous group. The differences in experiences due to differences in the nature of work and gender composition in the particular program were not taken into account; although they might have significant effect on experiences in engineering. For example, one obvious difference is the experience of working in bioengineering, where the proportion of women is more than 45 percent in comparison to computer engineering, where women represent only 11 percent of engineers. The nature of the jobs also varies significantly based on engineering branches and might affect the duration of the job search, job satisfaction, and intent to leave.

A follow-up to this study on the graduates of 2018 is further recommended to compare these results. This follow-up study would add to the findings of this investigation by providing a more up to date perspective on early career experiences in the engineering occupation. However, acknowledging these limitations, this study provides important information about BEng graduates' early career experience in Canada that is little known in the existing literature. Several implications can be drawn from this study for the policies and programs that focus on

women's retention in engineering. There is little evidence for overt gender-based discrimination in this study, at least at the point of the entry into the occupation and in terms of job satisfaction. However, despite these positive results for women's retention in engineering, factors such as visible minority, parent status, and their supervisory roles have adverse effects on their organizational commitment. Thus, from the policy point of view, more attention needs to be given to the everyday interactions at the engineering workplace, men's direct participation, and creation of a space for open dialog about how men and women can productively work in the occupation. Engineers might require rules of conduct that would allow clear and straightforward understanding of bullying that leads to women in supervisory roles and visible minority men and women desiring to look for jobs somewhere else.

Final thoughts

This study researched gender differences in early career experiences in engineering. The intent of this research, on the one hand, was to enrich the relevant literature in the field of the sociology of work and gender studies. On the other hand, this research was also informed by my own unsuccessful attempts to become a professional engineer in Canada. My initial questions regarding whether there are gender differences in occupational attainment were answered by this study. First, the results demonstrated that recent women BEng graduates' early career experiences are very different than those discussed in the early literature. Canadian employers seem to have developed a preference for hiring women engineers, resulting in these women's rapid entry into the occupation. However, these women's career prospects are still affected by their gender in this male-dominated occupation. While women are satisfied working as engineers, they are less likely than men to work in managerial jobs and, when they do, they are more likely to look for a job somewhere else. These findings I consider as a manifestation of

some aspects of engineering organizational culture that are deeply rooted in the gendered understanding of who deserves to be a manager in engineering and whose careers should be developed. Thus, I am not convinced that women's more rapid entry into engineering represents a complete transformation in the culture of engineering today. The positive changes in women's experiences in engineering are undeniable; however, the fight for full gender equity is not likely to be over just yet.

References

Abel, J. R., & Deitz, R. (2016). *Underemployment in the Early Careers of College Graduates Following the Great Recession* (No. w22654). National Bureau of Economic Research. Washington DC.

Acker, J. (2006). Inequality regimes gender, class, and race in organizations. *Gender and Society,* 20(4), 441-464.

Acker, J. (2009). From glass ceiling to inequality regimes. *Sociologie du Travail*, 51(2), 199–217.

Adams, R., Evangelou, D., English, L., Figueiredo, A. D., Mousoulides, N., Pawley, A. L.Trenor, J. M. (2011). Multiple perspectives on engaging future engineers. *Journal of Engineering Education*, 100(1), 48–88.

Adelman, C. (1998). *Women and Men of the Engineering Path: A Model for Analyses of Undergraduate Careers*. U.S. Government Printing Office, Superintendent of Documents, Mail Stop: SSOP, Washington, DC 20402-9328.

Akintayo, D. I. (2010). Work-family role conflict and organizational commitment among industrial workers in Nigeria. *International Journal of Psychology and Counselling*, 2(1), 1–8.

Alexander, Q. R., & Hermann, M. A. (2016). African-American women's experiences in graduate science, technology, engineering, and mathematics education at a predominantly white university: A qualitative investigation. *Journal of Diversity in Higher Education*, 9(4), 307.

Allen, T. D. (2001). Family-supportive work environments: The role of organizational perceptions. *Journal of Vocational Behavior*, 58(3), 414–435.

Alon, S., & Haberfeld, Y. (2007). Labour force attachment and the evolving wage gap between white, black, and Hispanic young women. *Work and Occupations*, 34(4), 369–398.

Amelink, C. T., & Creamer, E. G. (2010). Gender differences in elements of the undergraduate experience that influence satisfaction with the engineering major and the intent to pursue engineering as a career. *Journal of Engineering Education*, 99(1), 81-92.

Andrews, G. C., Aplevich, J. D., Fraser, R. A., MacGregor, C. G., & Ratz, H. C. (2015). *Introduction to Professional Engineering in Canada*. Toronto: Pearson.

Armstrong, P. & Armstrong, H. (2010). *The Double Ghetto : Canadian Women and their Segregated Work*. Rev. 3rd ed. Don Mills, Ont.: Oxford University Press.

Arrow, K. (1972). *Models of Job Discrimination, Racial Discrimination in Economic Life*. Heath, Lexington, MA: Heath.

Auspurg, K., Hinz, T., and Sauer, C. (2017). Why should women get less? Evidence on the gender pay gap from multifactorial survey experiments. *American Sociological Review, 82*(1), 179-210.

Ayre, M., Mills, J., and Gill, J. (2013). 'Yes, I do belong': the women who stay in engineering. *Engineering Studies,* 5(3*),* 216-232.

Bakan, D. 1966. *The Duality of Human Existence: An Essay on Psychology and Religion*. Chicago: Rand McNally.

Baker, C. E., Dunnavant, J., & McNair, J. (2015, June). How the Pathway to Engineering Affects Diversity in the Engineering Workforce: A Silicon Valley Case Study. In ASEE Annual Conference and Exposition, Seattle, WA.

Bell, D. (1976, May). The coming of the post-industrial society. *In The Educational Forum* (Vol. 40, No. 4, pp. 574-579*)*. London: Taylor & Francis Group.
Beasley, M. A., & Fischer, M. J. (2012). Why they leave: The impact of stereotype threat on the attrition of women and minorities from science, math and engineering majors. *Social Psychology of Education*, 15(4), 427-448.
Becker, G. S. (1962). Investment in human capital: A theoretical analysis. *Journal of Political Economy*, 70(5, Part 2), 9–49.
Beneria, L., Berik, G., & Floro, M. (2015). *Gender, Development and Globalization: Economics as If All People Mattered*. London: Routledge.
Bender, K. A., Donohue, S. M., and Heywood, J. S. (2005). Job satisfaction and gender segregation. *Oxford Economic Papers,* 57(3), 479-496.
Beniger, J. (2009). *The Control Revolution: Technological and Economic Origins of the Information Society*. Cambridge, MA: Harvard University Press.
Bennett, C. (2011). Beyond the leaky pipeline: consolidating understanding and incorporating new research: about women's science careers in the UK. *Brussels Economic Review*, 54(2/3), 149–176.
Benner, C. (2008). *Work in the New Economy: Flexible Labour Markets in Silicon Valley*. Malden, MA: Blackwell.
Benson, J., & Brown, M. (2011). Generations at work: are there differences and do they matter? *The International Journal of Human Resource Management*, 22(9), 1843–1865.
Bielby, W. T., & Baron, J. N. (1986). Men and women at work: Sex segregation and statistical discrimination. *American Journal of Sociology*, 91(4), 759–799.
Bidanda, B., Arisoy, O., & Shuman, L. J. (2006). Offshoring manufacturing: Implications for engineering jobs and education: A survey and case study. *Robotics and Computer-Integrated Manufacturing*, 22(5), 576–587.
Bilimoria, D., & Lord, L. (Eds.). (2014). *Women in STEM careers: International Perspectives on Increasing Workforce Participation, Advancement and Leadership*. Cheltenham: Edward Elgar Publishing.
Blau, F. D., and Kahn, L. M. (2000). Gender differences in pay. *Journal of Economic Perspectives,* 14(4), 75-99.
Blickenstaff, J. (2005). Women and science careers: leaky pipeline or gender filter?. *Gender and Education,* 17(4), 369-386.
Block, F. L. (1990). *Postindustrial Possibilities: A Critique of Economic Discourse*. Berkeley: University of California Press.
Bokemeier, J. L., & Lacy, W. B. (1987). Job values, rewards, and work conditions as factors in job satisfaction among men and women. *The Sociological Quarterly*, 28(2), 189-204.
Bonacich, E. (1972). A theory of ethnic antagonism: The split labour market. *American Sociological Review,* 3(4*),* 547–559.
Bonacich, E. (1976). Advanced capitalism and black/white race relations in the United States: A split labour market interpretation. *American Sociological Review* 41(1), 34-51,
Boulis, A. K., & Jacobs, J. A. (2008). *The changing face of medicine: women doctors and the evolution of health care in America*. Ithaca: Cornell University Press.
Bratti, M., McKnight, A., Naylor, R., and Smith, J. (2004). Higher education outcomes, graduate employment and university performance indicators. *Journal of the Royal Statistical Society: Series A (Statistics in Society),* 167(3), 475-496.

Brown, P., Hesketh, A., & Williams, S. (2004). *The Mismanagement of Talent: Employability and Jobs in the Knowledge Economy*. Oxford: Oxford University Press.
Brown, P., & Tannock, S. (2009). Education, meritocracy and the global war for talent. *Journal of Education Policy*, 24(4), 377-392.
Buchmann, C. & Mcdaniel A. (2016). Motherhood and the Wages of Women in Professional Occupations. *RSF: The Russell Sage Foundation Journal of the Social Sciences,* 2(4), 128-150.
Burke, R. J., & Mattis, M. C. (2007). *Women and Minorities in Science, Technology, Engineering, and Mathematics: Upping the Numbers*. London: Edward Elgar Publishing.
Burke, R., Koyuncu, M., and Fiksenbaum, L. (2009). Gender differences in work experiences, satisfactions and wellbeing among physicians in Turkey. *Gender in Management: An International Journal,* 24(2), 70-91.
Bültmann, U. (2012). Long working hours are associated with incident depressive and anxiety symptoms in women. *Evidence Based Mental Health,* 15(3), 58-68.
Bünning, M. (2015). What happens after the 'Daddy Months'? Fathers' involvement in paid work, childcare, and housework after taking parental leave in Germany. *European Sociological Review,* 31(6), 738-748.
Bystydzienski, J. (2009). Why so few women? Explaining gendered occupational outcomes in science, technology, engineering and mathematics fields. *Sex Roles,* 60(9), 751-753.
Casper, W. J., Martin, J. A., Buffardi, L. C., & Erdwins, C. J. (2002). Work-family conflict, perceived organizational support, and organizational commitment among employed mothers. *Journal of Occupational Health Psychology*, 7(2), 99–108.
Carnevale, A. P., Cheah, B., & Strohl, J. (2013). Hard times: College majors, unemployment and earnings: Not all college degrees are created equal. *Journal of Education Policy*, 20(2) 177-185
Castle, N. G., Engberg, J., Anderson, R., & Men, A. (2007). Job satisfaction of nurse aides in nursing homes: Intent to leave and turnover. *The Gerontologist*, 47(2), 193–204.
Cech, E. A. (2013). Ideological wage inequalities? The technical/social dualism and the gender wage gap in engineering. *Social Forces*, 91(4), 1147–1182.
Cech, E. A., & Blair-Loy, M. (2010). Perceiving glass ceilings? Meritocratic versus structural explanations of gender inequality among women in science and technology. *Social Problems,* 57(3), 371-397.
Cech, E., Rubineau, B., Silbey, S., and Seron, C. (2011). Professional role confidence and gendered persistence in engineering. *American Sociological Review,* 76(5), 641-666
Ceci, S. J., & Williams, W. M. (2011). Understanding current causes of women's underrepresentation in science. *Proceedings of the National Academy of Sciences*, 108(8), 3157–3162. Stable URL: https://www.jstor.org/stable/41060898
Ceci, S. J., & Williams, W. M. (2010). Sex differences in math-intensive fields. Current Directions in Psychological Science, 19(5), 275-279.
Ceci, S. J., Williams, W. M., & Barnett, S. M. (2009). Women's underrepresentation in science: sociocultural and biological considerations. Psychological bulletin, 135(2), 218.
Charles, M. (2011). A world of difference: international trends in women's economic status. Annual Review of Sociology, 37, 355-371.
Chesler, N. C., & Chesler, M. A. (2002). Gender-informed mentoring strategies for women engineering scholars: On establishing a caring community. *Journal of Engineering Education*, 91(1), 49-55.

Cennamo, L., & Gardner, D. (2008). Generational differences in work values, outcomes and person-organization values fit. *Journal of Managerial Psychology*, 23(8), 891–906.
Cheryan, S. (2012). Understanding the paradox in math-related fields: Why do some gender gaps remain while others do not? *Sex Roles,* 66(3), 184-190.
Cheng, G. H.-L., & Chan, D. K.-S. (2008). Who suffers more from job insecurity? A meta-analytic review. *Applied Psychology*, 57(2), 272–303.
Chirumbolo, A., & Hellgren, J. (2003). Individual and organizational consequences of job insecurity: A European study. *Economic and Industrial Democracy*, 24(2), 217-240.
Chiu, C. (1998). Do professional women have lower job satisfaction than professional men? Lawyers as a case study. *Sex Roles,* 38(7-8), 521-537.
Choi, S. (2017). Workforce diversity and job satisfaction of the majority and the minority: analyzing the asymmetrical effects of relational demography on whites and racial/ethnic minorities. *Review of Public Personnel Administration*, 37(1), 84–107.
Clark, A. E. (1997). Job satisfaction and gender: why are women so happy at work? *Labour Economics,* 4(4), 341-372.
Collins, R. (1975). *Conflict Sociology: Toward an Explanatory Science*. New York: Academic Press.
Cleves, M., Gould, W., Gould, W. W., Gutierrez, R., & Marchenko, Y. (2008). *An Introduction to Survival Analysis Using Stata*. College Station, TX: Stata Press.
Cohen, L., Broschak, J., & Haveman, H. (1998). And then there were more? The effect of organizational sex composition on the hiring and promotion of managers. *American Sociological Review,* 63(5), 711-727.
Cox, D., Oakes, N. (1984/2018). *Analysis of Survival Dat*a. New York: Routledge.
Crawley, S. (2015). Women in engineering ??? An equitable future. In *Power and Energy Engineering Conference (APPEEC), 2015 IEEE PES Asia-Pacific* (pp. 1–6).
Crompton, R., Brockmann, M., & Lyonette, C. (2005). Attitudes, women's employment and the domestic division of labour: a cross-national analysis in two waves. *Work, employment and society*, 19(2), 213-233.
Currall, S. C., Towler, A. J., Judge, T. A., and Kohn, L. (2005). Pay satisfaction and organizational outcomes. *Personnel Psychology,* 58(3), 613-640.
Curry, J. P., Wakefield, D. S., Price, J. L., & Mueller, C. W. (1986). On the causal ordering of job satisfaction and organizational commitment. *Academy of Management Journal*, 29(4), 847-858.
Dalgiç, G.(2014). A meta-analysis: exploring the effects of gender on organizational commitment of teachers. *Issues in Educational Research*, 24(2), 133-151.
Devine, F. (1992). Gender segregation in the engineering and science professions: A case of continuity and change. *Work, Employment and Society,* 6(4), 557-575.
De Witte, H. (2005). Job insecurity: Review of the international literature on definitions, prevalence, antecedents and consequences. *SA Journal of Industrial Psychology,* 31(4), 1-6.
Diekman, A. B., Weisgram, E. S., & Belanger, A. L. (2015). New routes to recruiting and retaining women in STEM: Policy implications of a communal goal congruity perspective. *Social Issues and Policy Review*, 9(1), 52-88.
Dionne-Simard, D. (2016). *Women in Scientific Occupations in Canada* (Insights on Canadian society). Statistics Canada. Ottawa.

Dobránszky, J., and Dobránszky, J. (2011). Placement difficulties faced by young female engineers in Hungary. *Journal for Perspectives of Economic, Political, and Social Integration,* 17(1-2), 223-235.

Dodson, T. A., and Borders, L. A. D. (2006). Men in traditional and nontraditional careers: Gender role attitudes, gender role conflict, and job satisfaction. *The Career Development Quarterly,* 54(4), 283-296.

Dozier, R. (2010). The declining relative status of black women workers, 1980–2002. *Social Forces*, 88(4), 1833–1857.

DuBois, B. (1983). Passionate scholarship: notes on values, knowing and method in feminist social sciences. In Bowles, G. and Duelli Klein, R. (Eds.), *Theories of Women's Studies* (pp.105-117). London: Routledge and Kegan Paul.

Duxbury, L., Lyons, S., & Higgins, C. (2007). Dual-income families in the new millennium: Reconceptualizing family type. *Advances in Developing Human Resources*, 9(4), 472-486.

Eagly, A. H. 1987. *Sex Differences in Social Behavior: A Social-Role Interpretation*. Hillsdale, NJ: Erlbaum.

Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross-national patterns of gender differences in mathematics: a meta-analysis. Psychological Bulletin, 136(1), 103.

England, P. (2010). The gender revolution: Uneven and stalled. *Gender & Society*, *24*(2), 149-166.

England, P. (2017). *Households, Employment, and Gender: A Social, Economic, and Demographic view*. Abingdon, U.K.: Routledge.

Engineers Canada. (2012). *Engineers Canada 2012 Membership Survey*. https://engineerscanada.ca/sites/default/files/w_2012_Membership_Survey_Report.pdf. Retrieved on October 16, 2018.

Engineers Canada, (2016). *Annual Report 2016*. Ottawa: Engineers Canada. https://engineerscanada.ca/about/annual-reports/2016-annual-report. Retrieved on October 30, 2018.

Engineers Canada (2017). Enrolment and Degrees Awarded Report 2017.Ottawa: Engineers Canada. https://engineerscanada.ca/reports/enrolment-and-degrees-awarded-report. Retrieved on May 1, 2019.

Evetts, J. (1993). Women and management in engineering: The "glass ceiling" for women's careers. *Women in Management Review,* 8(7), 19-31.

Evetts, J. (2003). The sociological analysis of professionalism: Occupational change in the modern world. *International Sociology*, 18(2), 395-415.

Evetts, J. (2014). *Women and Career: Themes and Issues in Advanced Industrial Societies*. London: Longman.

Faulkner, W. (2007). “Nuts and Bolts and People”: Gender-Troubled Engineering Identities. *Social Studies of Science*, 37(3), 331–356.

Faulkner, W. (2009). Doing gender in engineering workplace cultures. II. Gender in/authenticity and the in/visibility paradox. *Engineering Studies*, *1*(3), 169–189.

Ferguson, S. J.. (2016). “Women and Education: Qualifications, Skills and Technology” Catalogue no. 89-503-X Statistics Canada. Ottawa.

Ferguson, S. J., & Wang, S. (2014). *Graduating in Canada: Profile, Labour Market Outcomes and Student Debt of the Class of 2009-2010*. Statistics Canada. Ottawa.

Fenwick, T. (2004). What happens to the girls? Gender, work and learning in Canada's 'new economy'. *Gender and Education*, 16(2), 169-185.
Fouad, N. A., Singh, R., Fitzpatrick, M. E., & Liu, J. P. (2011). Stemming the tide: Why women leave engineering. *University of Wisconsin-Milwaukee, Final report from NSF Award*, *827553*.
Fouad, N. A., Singh, R., Cappaert, K., Chang, W.-H., and Wan, M. (2016). Comparison of women engineers who persist in or depart from engineering. *Journal of Vocational Behavior,* 92(4), 79-93.
Franzway, S., Sharp, R., Mills, J. E., & Gill, J. (2009). Engineering Ignorance: The Problem of Gender Equity in Engineering. *Frontiers: A Journal of Women Studies*, 30(1), 89–106.
Freeman, B., Marginson, S., & Tytler, R. (2014). *The Age of STEM: Educational Policy and Practice Across the World in Science, Technology, Engineering and Mathematics*. London. Routledge.
Freeman, R. B. (2006). Does globalization of the scientific/engineering workforce threaten US economic leadership? *Innovation Policy and the Economy*, 6(3), 123–157.
Frehill, L. M. (1997). Education and occupational sex segregation: The decision to major in engineering. *Sociological Quarterly*, 38(2), 225-249.
Gelsthorpe, Lorraine & Morris, Alison (1990). *Feminist Perspectives in Criminology*. Buckingham: Open University Press.
Gerson, J. M., & Peiss, K. (1985). Boundaries, negotiation, consciousness: Reconceptualizing gender relations. *Social Problems*, 32(4), 317-331.
Gibson, S. L., & Espino, M. M. (2016). Uncovering black womanhood in engineering. *NASPA Journal About Women in Higher Education*, 9(1), 56–73.
Giddens, A. (1991). *The Consequences of Modernity*. Cambridge, England: Polity Press.
Green, F., & Zhu, Y. (2010). Overqualification, job dissatisfaction, and increasing dispersion in the returns to graduate education. *Oxford Economic Papers*, 62(4), 740–763.
Gill, J., Sharp, R.Mills, J. and Franzway, S. (2008) I still wanna be an engineer! Women, education and the engineering profession. *European Journal of Engineering Education* 33(4), 391-402.
Golden, L. (2008). Limited access: Disparities in flexible work schedules and work-at-home. *Journal of Family and Economic Issues,* 29(1), 86-109.
Goldin, C., & Katz, L. F. (2008). Mass secondary schooling and the state: the role of state compulsion in the high school movement. In *Understanding Long-Run Economic Growth: Geography, institutions, and the Knowledge Economy,* 275-310. Chicago: University of Chicago Press.
Grusky, O. (1966). Career mobility and organizational commitment. *Administrative Science Quarterly*, 10(4), 488-503.
Gunlu, E., Aksarayli, M., & Şahin Perçin, N. (2010). Job satisfaction and organizational commitment of hotel managers in Turkey. *International Journal of Contemporary Hospitality Management*, 22(5), 693–717.
Hacker, S. (2017). *Pleasure, Power and Technology: Some Tales of Gender, Engineering, and the Cooperative Workplace*. London: Routledge.
Hahn, G., & Meeker, William Q. (1991.). *Statistical Intervals: A Guide for Practitioners* (Wiley series in probability and mathematical statistics. Applied probability and statistics). New York: Wiley.

Hall, D. T., Lee, M. D., Kossek, E. E., and Heras, M. L. (2012). Pursuing career success while sustaining personal and family well-being: A study of reduced-load professionals over time. *Journal of Social Issues,* 68(4), 742-766

Hall, W. M., Schmader, T., & Croft, E. (2015). Engineering exchanges: Daily social identity threat predicts burnout among female engineers. *Social Psychological and Personality Science*, 6(5), 528-534.

Hango, D. W. (2013). *Gender Differences in Science, Technology, Engineering, Mathematics and Computer Science (STEM) Programs at University*. Catalogue no. 75-006-X. Statistics Canada. Ottawa. http://epe.lacbac.gc.ca/100/201/301/weekly_checklist/2013/internet/w13-51-U-E.html/collections/collection_2013/statcan/75-006-x/75-006-2013001-9-eng.pdf. Retrieved on October 6, 2018.

Hakim, C. (1991). Grateful slaves and self-made women: fact and fantasy in women's work orientations. *European Sociological Review,* 7(2), 101-121.

Hakim, C. (2002). Lifestyle preferences as determinants of women's differentiated labor market careers. *Work and Occupations*, 29(4), 428-459.

Hakim, C. (2003). A new approach to explaining fertility patterns: Preference theory. *Population and Development Review*, 29(3), 349-374.

Harding, S. G. (1986). *The Science Question in Feminism*. Ithaca: Cornell University Press.

Hartmann, H. I. (1979). The unhappy marriage of Marxism and feminism: Towards a more progressive union. *Capital & Class*, 3(2), 1–33.

Heather, A. E. (2003). Building a workplace of choice: Using the work environment to attract and retain top talent. *Journal of Facilities Management,* 2(3), 244-257.

Herzenberg, S. A., Alic, J. A., & Wial, H. (2000). *New Rules for a New Economy: Employment and Opportunity in Postindustrial America*. Ithaca: Cornell University Press.

Hill, C., Corbett, C., & St. Rose, A. (2010). *Why So Few? Women in Science, Technology, Engineering, and Mathematics*. Washington: American Association of University Women.

Hodson, R. (1989). Gender differences in job satisfaction: Why aren't women more dissatisfied? *The Sociological Quarterly,* 30(3), 385-399.

Houghton, J., & Sheehan, P. (2000). *A Primer on the Knowledge Economy*. New York: Edward Elgar.

Houston, D. M. (2005). Work-life balance in the 21st century. *In Work-life Balance in the 21st Century* (pp. 1-10). London: Palgrave Macmillan.

Howe-Walsh, L., & Turnbull, S. (2016). Barriers to women leaders in academia: tales from science and technology. *Studies in Higher Education*, 41(3), 415–428.

Huang, G., Taddese, N., & Walter, E. (2000). Entry and persistence of women and minorities in college science and engineering education. *Education Statistics Quarterly*, 2(3), 59–60.

Hunt, A. (1986). Use of quantitative methods in researching issues which affect women. *Methodological Issues in Gender Research,* 10(2), 12-19.

Hunt, J. (2016). Why do women leave science and engineering?. *ILR Review*, 69(1), 199-226.

Hyde, J. S., Canning, E. A., Rozek, C. S., Clarke, E., Hulleman, C. S., & Harackiewicz, J. M. (2017). The role of mothers' communication in promoting motivation for math and science course-taking in high school. *Journal of Research on Adolescence*, 27(1), 49–64.

Hyde, J. S., Lindberg, S. M., Linn, M. C., Ellis, A. B., & Williams, C. C. (2008). Gender similarities characterize math performance. *Science*, 321(5888), 494-495.

Jacobs, J. A. (1989). *Revolving doors: Sex Segregation and Women's Careers.* Stanford: Stanford University Press.
Jagacinski, C. M. (1987). Androgyny in a male-dominated field: The relationship of sex-typed traits to performance and satisfaction in engineering. *Sex Roles,* 17(9-10), 529-547.
Jena, R. K. (2015). An assessment of factors affecting organizational commitment among shift workers in India. *Management: Journal of Contemporary Management Issues*, 20(1), 59–77.
Jenkins, A. K. (2009). Keeping the talent: Understanding the needs of engineers and scientists in the defense acquisition workforce. *Defense AR Journal*, 16(1), 19–31.
Jones, B. D., Ruff, Chloe, & Paretti, Marie C. (2013). The Impact of engineering identification and stereotypes on undergraduate women's achievement and persistence in engineering. *Social Psychology of Education: An International Journal,* 16(3), 471-493.
Kahn, L. B. (2010). The long-term labour market consequences of graduating from college in a bad economy. *Labour Economics*, 17(2), 303–316.
Krahn, H., Hughes, K. D., & Lowe, G. S. (2010). *Work, Industry, and Canadian Society*. Toronto. Nelson Education.
Kalleberg, A. L. (1977). Work values and job rewards: A theory of job satisfaction. *American Sociological Review*, 42(1)124-143.
Kalleberg, A. L. (2008). The mismatched worker: When people don't fit their jobs. *The Academy of Management Perspectives,* 22(1), 24-40.
Kalleberg, A. L. (2009). Precarious work, insecure workers: Employment relations in transition. *American Sociological Review*, 74(1), 1–22.
Kalleberg, A. L., Rasell E., Cassirer N., Reskin B.F., Hudson K., Webster D., Appelbaum E., & Spalter-Roth R.M. *Nonstandard Work, Substandard Jobs. Flexible Work Arrangements in the US*. Washington, DC: Economic Policy Institute.
Kanter, R. M. (1977). *Men and Women of the Corporation*. New York. Basic Books.
Kerse, G., Kocak, D., & Ozdemir, S. (2018). Does the perception of job insecurity bring emotional exhaustion? The relationship between Job insecurity, affective commitment and emotional exhaustion. *Business and Economics Research Journal*, 9(3), 651–664.
Khalili, A. & Asmawi, A. (2012). Appraising the impact of gender differences on organizational commitment: empirical evidence from a private SME in Iran. *International Journal of Business and Management,* 7(5), 100-110.
Kim, S. (2005). Gender differences in the job satisfaction of public employees: a study of Seoul Metropolitan Government, Korea. *Sex Roles*, 52(9-10), 667-681.
Koch, J. L., & Steers, R. M. (1978). Job attachment, satisfaction, and turnover among public sector employees. *Journal of Vocational Behavior*, 12(1), 119–128.
Lacy, W. B., Bokemeier, J. L., & Shepard, J. M. (1983). Job attribute preferences and work commitment of men and women in the United States. *Personnel Psychology*, 36(2), 315-329.
Legault, M.-J., & Chasserio, S. (2013). Family obligations or cultural constraints? Obstacles in the path of professional women. *Journal of International Women's Studies,* 4(3), 108-125.
Lee W., J., & Galpin, T. J. (2010). The engagement factor: Building a high-commitment organization in a low-commitment world. *Journal of Business Strategy*, 31(5), 14–24.

Lingard, H. (2003). The impact of individual and job characteristics on "burnout" among civil engineers in Australia and the implications for employee turnover. *Construction Management and Economics*, 21(1), 69–80.
Lips, H., and Lawson, K. (2009). Work values, gender, and expectations about work commitment and pay: Laying the groundwork for the "motherhood penalty"? *Sex Roles,* 61(9-10), 667-676.
Locke, E. A. (1969). What is job satisfaction? *Organizational Behavior and Human Performance,* 4(4), 309-336.
Long, J., & Freese, J. (2014). *Regression Models for Categorical Dependent Variables using Stata* (Third ed.). London: Taylor and Francis.
Lowe, D., Levitt, K., & Wilson, T. (2011). Solutions for retaining generation Y employees in the workplace. *Engineering Management Review, IEEE*, 39(2), 46–52.
Lup, D. (2018). Something to celebrate (or not): the differing impact of promotion to manager on the job satisfaction of women and men. *Work, Employment and Society,* 32(2), 407-425.
Major, B., McFarlin, D. B., & Gagnon, D. (1984). Overworked and underpaid: on the nature of gender differences in personal entitlement. *Journal of Personality and Social Psychology*, 47(6), 1399-1414.
Mann, A., & DiPrete, T. A. (2013). Trends in gender segregation in the choice of science and engineering majors. *Social Science Research*, 42(6), 1519-1541.
Marascuilo, L., & Levin, Joel R. (1983). *Multivariate Statistics in the Social Sciences: A Researcher's Guide*. Monterey, CA: Brooks/Cole Publisher.
Maynard, Mary (1994). Methods, practice and epistemology: the debate about feminism and research. In Maynard, M. & Purvis, J.(Eds.), *Researching Women's Lives from a Feminist Perspective* (pp.10-27). London: Taylor and Francis.
McIlwee, J. S., and Robinson, J. G. (1992). *Women in Engineering: Gender, Power, and Workplace Culture*. Albany, NY: SUNY Press.
Marsden, P. V., Kalleberg, A. L., & Cook, C. R. (1993). Gender differences in organizational commitment: Influences of work positions and family roles. *Work and Occupations*, 20(3), 368–390.
Martínez-León, I. M., Olmedo-Cifuentes, I., & Ramón-Llorens, M. C. (2018). Work, personal and cultural factors in engineers' management of their career satisfaction. *Journal of Engineering and Technology Management*, 47(Complete), 22–36.
Maynard, D. C., & Joseph, T. A. (2008). Are all part-time faculty underemployed? The influence of faculty status preference on satisfaction and commitment. *Higher Education*, 55(2), 139.
Messner, W. (2017). The role of gender in building organizational commitment in India's services sourcing industry. *IIMB Management Review*, 29(3), 188-202.
Meyer, M., & Marx, S. (2014). Engineering Dropouts: A qualitative examination of why undergraduates leave engineering. *Journal of Engineering Education*, 103(4), 525–548.
Mies, M. (1998). *Patriarchy and Accumulation on a World Scale: Women in the International Division of Labour*. London: Zed.
Mills, J. E., Franzway, S., Gill, J. &, Sharp, R. (2014). *Challenging Knowledge, Sex and Power: Work and Engineering*. London: Routledge.
Miller, J. (1980). Individual and occupational determinants of job satisfaction: A focus on gender differences. *Sociology of Work and Occupations,* 7(3), 337-366.

Mitchell, B. A. (2017). *Family Matters: An Introduction to Family Sociology in Canada*. 3rd ed. Toronto: Canadian Scholars' Press.
Mood, C. (2010). Logistic regression: Why we cannot do what we think we can do, and what we can do about it. *European Sociological Review*, 26(1), 67-82.
Moon, J. S., & Choi, S. B. (2017). The impact of career management on organizational commitment and the mediating role of subjective career success: The case of Korean R&D employees. *Journal of Career Development*, 44(3), 191–208.
Mortimer, J. T., Finch, M. D., and Maruyama, G. (1988). Work experience and job satisfaction: Variation by age and gender. In Mortimer, J. T. & Borman K. M. (Eds.), *Work Experience and Psychological Development Through the Life Span*. Boulder, CO: Westview Press, 110-128.
Moyser, M. (2017). *Women and Paid Work*. Statistics Canada. Ottawa.
Mowday, R. T., Porter, L. W., & Steers, R. M. (2013). *Employee-Organization Linkages: The Psychology of Commitment, Absenteeism, and Turnover*. New York: Academic Press.
Mueller, C. W., and Wallace, J. E. (1996). Justice and the paradox of the contented female worker. *Social Psychology Quarterly*, 2(1) 338-349.
Murray, M. A., and Atkinson, T. (1981). Gender differences in correlates of job satisfaction. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement,* 13(1), 44-56.
Munsch, C. L. (2016). Flexible work, flexible penalties: The effect of gender, childcare, and type of request on the flexibility bias. *Social Forces*, 12(1), 23-36.
Natural Sciences and Engineering Research Council of Canada (NSERC), Corporate Planning and Policy Development. (2010). *Women in science and engineering in Canada*. Ottawa, ON: Natural Sciences and Engineering Research Council of Canada. http://www.nserc-crsng.gc.ca/_doc/Reports-Rapports/Women_Science_Engineering_e.pdf. Retrieved July 15, 2018.
Niemeier, D. A., & Smith, V. (2005). Building careers, transforming institutions: Underrepresented women and minorities, leadership opportunities, and interinstitutional networking. *Journal of Women and Minorities in Science and Engineering*, 11(2), 181-196.
Ng, E. S. W., Schweitzer, L., & Lyons, S. T. (2010). New generation, great expectations: A field study of the millennial generation. *Journal of Business and Psychology*, 25(2), 281–292.
O'Donnell, V., Almey, M., Lindsay, C., Fournier-Savard, P., Mihorean, K., Charmant, M., Aston, C. (2005). Women in Canada: A gender-based statistical report. Ottawa. Statistics Canada. *https://www150.statcan.gc.ca/n1/en/pub/89-503-x/89-503-x2010001-eng.pdf*. Retrieved on November 13, 2018.
O' Leary, V. (1977). *Towards Understanding Women*. Monterey. California: Brooks/Cole.
Ollo-López, A., & Nuñez, I. (2018). Exploring the organizational drivers of sexual harassment: Empowered jobs against isolation and tolerant climates. *Employee Relations*, 40(2), 174-192.
Olson, J. E. (2013). Human capital models and the gender pay gap. *Sex Roles,* 68(3-4), 186-197.
Ontario Professional Society of Engineers (OPSE), (2015). Crisis in Engineering Labour Market Report 2015. https://www.ospe.on.ca/public/documents/advocacy/2015-crisis-in-engineering-labour-market.pdf Retrieved November 18, 2018.
Ontario Professional Society of Engineers (OPSE), 2018. 2018 Annual Report https://www.ospe.on.ca/downloads/Annual-Report-2018. Retrieved on October 18, 2018

Passaretta, G., and Triventi, M. (2015). Work experience during higher education and post-graduation occupational outcomes: A comparative study on four European countries. *International Journal of Comparative Sociology,* 56(3-4), 232-253.
Pencavel, J. (2015). The productivity of working hours. *The Economic Journal,* 25(9), 2052-2076.
Perrucci, C. C. (1970). Minority status and the pursuit of professional careers: Women in science and engineering. *Social Forces,* 49(2), 245-259.
Perrons, D. (2005). Gender mainstreaming and gender equality in the new (market) economy: An analysis of contradictions. *Social Politics: International Studies in Gender, State & Society*, 12(3), 389-411.
Pietersen, C. (2005). Job satisfaction of hospital nursing staff. *SA Journal of Human Resource Management*, 3(2), 19-25.
Phelps, E. S. (1972). The statistical theory of racism and sexism. *The American Economic Review*, 21(3)*,* 659-661.
NSERC (2010). Women in science and engineering in Canada. Ontario: Natural Sciences and Engineering Research Council of Canada. http://www.nserc-crsng.gc.ca/_doc/Reports-Rapports/Women_Science_Engineering_e.pdf. Retrieved on October 24, 2018.
Polkowska, D. (2014). Why the scientific pipeline is still leaking? Women scientists and their work–life balance in Poland. *International Studies in Sociology of Education,* 24(1), 24-43.
Post, C., DiTomaso, N., Farris, G. F., and Cordero, R. (2009). Work–family conflict and turnover intentions among scientists and engineers working in R and D. *Journal of Business and Psychology,* 24(1), 19-32.
Price, J. L. (1997). Handbook of organizational measurement. *International Journal of Manpower,* 18(4/5/6), 305-558.
Porter, L. W., Steers, R. M., Mowday, R. T., & Boulian, P. V. (1974). Organizational commitment, job satisfaction, and turnover among psychiatric technicians. *Journal of Applied Psychology*, 59(5), 603- 617.
Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology,* 30(2), 199-220.
Powell, A., Dainty, A., & Bagilhole, B. (2012). Gender stereotypes among women engineering and technology students in the UK: lessons from career choice narratives. *European Journal of Engineering Education*, 37(6), 541–556.
Powell, A., & Sang, K. J. (2015). Everyday experiences of sexism in male-dominated professions: A Bourdieusian perspective. *Sociology*, 49(5), 919–936.
Pupo, N., & Thomas, M. P. (2010). *Interrogating the New Economy: Restructuring Work in the 21st Century*. Toronto: University of Toronto Press.
Quinn, R. P., Staines, G. L., and McCullough, M. R. (1974). *Job Satisfaction: Is There a Trend?* Washington, DC: US Dept. of Labour, Manpower Administration. Washington, DC: US Govt. Printing Office.
Quinn, B. (2002). Sexual harassment and masculinity: The power and meaning of "Girl Watching." *Gender & Society*, 16(3), 386–402.
Ramsdal, H. (2016). *Flexible Organizations and the New Working Life: A European Perspective*. London: Routledge.

Ranson, G. (1998). Education, work and family decision making: Finding the "right time" to have a baby. *Canadian Review of Sociology & Anthropology/Revue canadienne de sociologie et anthropologie,* 35(4), 517-533.
Ranson, G. (2003). Beyond 'gender differences': A Canadian study of women's and men's careers in engineering. *Gender, Work and Organization,* 10(1), 22-41.
Ramazanoglu, Caroline (1992). On feminist methodology: male reason versus female empowerment. *Sociology,* 26(2), 207-212.
Ramirez, F. O., & Kwak, N. (2015). Women's Enrollments in STEM in higher education: cross-national trends, 1970–2010. In In Pearson Jr., W., Frehill, L. M. & McNeely, C. L. (Eds.), *Advancing Women in Science* (pp. 9–49). London: Springer International Publishing.
Ranson, G. (2005). No longer "one of the boys": Negotiations with motherhood, as prospect or reality, among women in engineering. *Canadian Review of Sociology/Revue Canadienne de Sociologie*, 42(2), 145–166.
Rawlins, C., Indvik, J., & Johnson, P. R. (2008). Understanding the new generation: What the Millennial cohort absolutely, positively must have at work. *Journal of Organizational Culture, Communications and Conflict*, 12(2), 10-24.
Reich, R. B. (2002). *The Future of Success: Working and Living in the New Economy*. New York: Vintage.
Reinharz, Shulamit (1979). *On Becoming a Social Scientist*. San Francisco: Jossey-Bass.
Reskin, B. (1993). Sex segregation in the workplace. *Annual Review of Sociology*, 19(1), 241-270.
Risman, B. J. (2004). Gender as a social structure: Theory wrestling with activism. *Gender & society*, 18(4), 429-450.
Robinson, J., & Mcilwee, J. (1989). Women in engineering: A promise unfulfilled? *Social Problems,* 36(5), 455-472.
Robelen, E. W. (2010). STEM careers; why so few? Women in science, technology, engineering, and mathematics. *Education Week*, 29(27), 4-10.
Robison, K. K., & Crenshaw, E. M. (2002). Post-industrial transformations and cyber-space: A cross-national analysis of Internet development. *Social Science Research*, 31(3), 334-363.
Robst, J. (2007). Education, college major, and job match: Gender differences in reasons for mismatch. *Education Economics*, 15(2), 159–175.
Rosenbach, W. E., Dailey, R. C., and Morgan, C. P. (1979). Perceptions of job characteristics and affective work outcomes for women and men. *Sex Roles,* 5(3), 267-277.
Rosser, S. V. (2003). Attracting and retaining women in science and engineering. *Academe*, 89(4), 24–28.
Sabharwal, M., and Corley, E. A. (2009). Faculty job satisfaction across gender and discipline. *The Social Science Journal,* 46(3), 539-556.
Salas-Velasco, M. (2007). The transition from higher education to employment in Europe: the analysis of the time to obtain the first job. *Higher Education*, 54(3), 333–360.
Sassler, S., Glass, J., Levitte, Y., & Michelmore, K. M. (2017). The missing women in STEM? Assessing gender differentials in the factors associated with transition to first jobs. *Social Science Research*, 63(1), 192-208.
Schellenberg, K. (1996). Taking it or leaving it: Instability and turnover in a high-tech firm. *Work and Occupations,* 23(2), 190-213.

Sears, A. (1999). The "lean" state and capitalist restructuring: Towards a theoretical account. *Studies in Political Economy*, 59(1), 91-114.
Shen, H. (2013). Mind the gender gap. *Nature*, 495(7439), 22.
Sigalit R., & Ayala, M. (2008). Gender differences in engineers' burnout. *Equal Opportunities International*, 27(8), 677–691.
Sirianni, C., & Negrey, C. (2000). Working time as gendered time. *Feminist Economics*, 6(1), 59-76.
Singh, P., & Loncar, N. (2010). Pay satisfaction, job satisfaction and turnover intent. *Relations Industrielles / Industrial Relations*, 65(3), 470–490
Smith, D. (1974). Women's perspective as a radical critique of sociology. *Sociological Inquiry,* 44, 7-13.
Smith, D. B., and Plant, W. T. (1982). Sex differences in the job satisfaction of university professors. *Journal of Applied Psychology,* 67(2), 249.
Smith, N., Smith, V., & Verner, M. (2006). Do women in top management affect firm performance? A panel study of 2,500 Danish firms. *International Journal of Productivity and Performance Management,* 55(7), 569-593.
Sousa-Poza, A., & Sousa-Poza, A. A. (2003). Gender differences in job satisfaction in Great Britain, 1991–2000: permanent or transitory?. *Applied Economics Letters*, 10(11), 691-694.
Sousa-Poza, A., Sousa-Poza, A. A. (2007). The effect of job satisfaction on labour turnover by gender: An analysis for Switzerland. *Journal of Socio-Economics,* 36(6), 895-913.
Sparks, M., Zehr, D., & Painter, B. (2004). Predictors of life satisfaction: Perceptions of older community-dwelling adults. *Journal of Gerontological Nursing*, 30(8), 47-53.
Statistics Canada. (2013). *National Graduates Survey (NGS) 2013.* Accessed in Research Data Centres.
Steers, R. M. (1977). Antecedents and outcomes of organizational commitment. *Administrative Science Quarterly*, 22(1), 12-24.
Stone, P. (2008). *Opting out?: Why Women Really Quit Careers And Head Home*. Berkeley: University of California Press.
Stromquist, N. P., & Monkman, K. (Eds.). (2014). Globalization and education: Integration and contestation across cultures. R&L Education. *Studies in Political Economy*, 59(1), 91-114.
Sturgeon, T. J. (2002). Modular production networks: a new American model of industrial organization. *Industrial and corporate change*, 11(3*),* 451-496
Suki, N. M., Suki, N. M., & Gumbang, B. (2010). Differences between job satisfaction, organizational commitment and gender. *Labuan E-Journal of Muamalat and Society*, *4*(2010), 1–13.
Syed, M., & Chemers, M. M. (2011). Ethnic minorities and women in STEM: Casting a wide net to address a persistent social problem. *Journal of Social Issues*, 67(3), 435-441.
Tang, J. (2000). *Doing Engineering: The Career Attainment and Mobility of Caucasian, Black, and Asian-American Engineers*. New York: Rowman & Littlefield.
Tichenor, V. (2005). Maintaining men's dominance: Negotiating identity and power when she earns more. *Sex Roles,* 53(3-4), 191-205
Tolentino, R. C. (2013). Organizational commitment and job performance of the academic and administrative personnel. *International Journal of Information Technology and Business Management*, 15(1), 51–59.

Tomaskovic-Devey, D., & Skaggs, S. (1999). An establishment-level test of the statistical discrimination hypothesis. *Work and Occupations*, 26(4), 422-445.
Treleaven, C. (2015). "Gender, Generation, and Jobs: Differences in Gender Role Ideologies by Age and Occupation" *MA Research Paper*. 1. https://ir.lib.uwo.ca/sociology_masrp/1. Retrieved May 1, 2018.
Turcotte, M. (2011). *Women and Education*. Ottawa: Statistics Canada.
Vandenberghe, C., & Tremblay, M. (2008). The role of pay satisfaction and organizational commitment in turnover intentions: A two-sample study. *Journal of Business and Psychology*, 22(3), 275–286.
Walters, D. (2004). A Comparison of the Labour Market Outcomes of Postsecondary Graduates of Various Levels and Fields over a Four-Cohort Period. *The Canadian Journal of Sociology*, 29(1), 1–27.
Wang, M. T., Eccles, J. S., & Kenny, S. (2013). Not lack of ability but more choice: Individual and gender differences in choice of careers in science, technology, engineering, and mathematics. *Psychological Science*, 24(5), 770-775.
Watson, J. M., and Meiksins, P. F. (1991). What do engineers want? Work values, job rewards, and job satisfaction. *Science, Technology and Human Values,* 16(2), 140-172.
Weaver, C. N. (1978). Sex differences in the determinants of job satisfaction. *Academy of Management Journal,* 21(2), 265-274.
Webster, J. (1999). Technological work and women's prospects in the knowledge economy: an agenda for research. *Information, Communication & Society*, 2(2), 201-221.
Wilthagen, T., & Tros, F. (2004). The concept of "flexicurity": a new approach to regulating employment and labour markets. *Transfer: European Review of Labour and Research*, 10(2), 166–186.
White, M., Hill, S., McGovern, P., Mills, C., & Smeaton, D. (2003). "High-performance" management practices, working hours and work–life balance. *British Journal of Industrial Relations*, 41(2), 175–195.
Wallace, J. E. (1995). Organizational and professional commitment in professional and nonprofessional organizations. *Administrative Science Quarterly*, 1(3), 228-255
Wittig, M. (1992). The straight mind and other essays. In M. Wittig (Ed.), *One Is Not Born a Woman* (pp. 9–20). Boston: Beacon.
Xie, Y., & Shauman, K. A. (2003). Women in science. Cambridge, MA: Harvard University Press.
Xu, Y. J. (2008). Gender disparity in STEM disciplines: A study of faculty attrition and turnover intentions. *Research in Higher Education,* 49(7), 607-624.
Yadav, O. P., Nepal, B. P., Rahaman, M. M., and Lal, V. (2017). Lean implementation and organizational transformation: A literature review. *Engineering Management Journal,* 29(1), 2-16.
You, W. (2015) *Does Patriarchy Still Exist? An Examination of Equal Employment Opportunities in the United States*. Scripps Senior Theses. 643.
Zuo, J. (2004). Shifting the breadwinning boundary: The role of men's breadwinner status and their gender ideologies. *Journal of Family Issues*, 25(6), 811–832.
Zou, M. (2015). Gender, work orientations and job satisfaction. *Work, Employment and Society,* 29(1), 3-22.

Zywno, M. S., Gilbride, K. A., Hiscocks, P. D., Waalen, J. K., and Kennedy, D. C. (1999). Attracting women into engineering-a case study. *IEEE Transactions on Education,* 42(4[+ cdrom]), 7.

Appendix A. Study participants' educational programs.

1	Engineering, General
2	Aerospace, Aeronautical and Astronautical Engineering
3	Agricultural/Biological Engineering and Bioengineering
4	Architectural Engineering
5	Biomedical/Medical Engineering
6	Ceramic Sciences and Engineering
7	Chemical Engineering
8	Civil Engineering, General
9	Geotechnical Engineering
10	Structural Engineering
11	Transportation and Highway Engineering
12	Water Resources Engineering
13	Civil Engineering, Other
14	Computer Engineering, General
15	Computer Hardware Engineering
16	Computer Software Engineering
17	Computer Engineering, Other
18	Electrical, Electronics and Communications Engineering
19	Engineering Mechanic
20	Engineering Physics
21	Engineering Science
22	Environmental/Environmental Health Engineering
23	Materials Engineering
24	Mechanical Engineering
25	Metallurgical Engineering
26	Mining and Mineral Engineering
27	Naval Architecture and Marine Engineering
28	Nuclear Engineering
29	Ocean Engineering
30	Petroleum Engineering
31	Systems Engineering
32	Textile Sciences and Engineering
33	Materials Science
34	Polymer/Plastics Engineering
35	Construction Engineering

36	Forest Engineering
37	Industrial Engineering
38	Manufacturing Engineering
39	Operations Research
40	Surveying Engineering
41	Geological/Geophysical Engineering
42	Engineering, Other

Appendix B. Supplemental Tables.

Table 10: The proportion of BEng graduates in comparison to all other Bachelor degree graduates, (NGS 2013).

The field of study	Men	Women
Business Management And Administration	43%	39%
Health Services	30%	45%
Engineering	4%	2%
Other	23%	16%
	100%	100%

Table 11: The importance in choice of engineering program for BEng graduates, (NGS 2013).

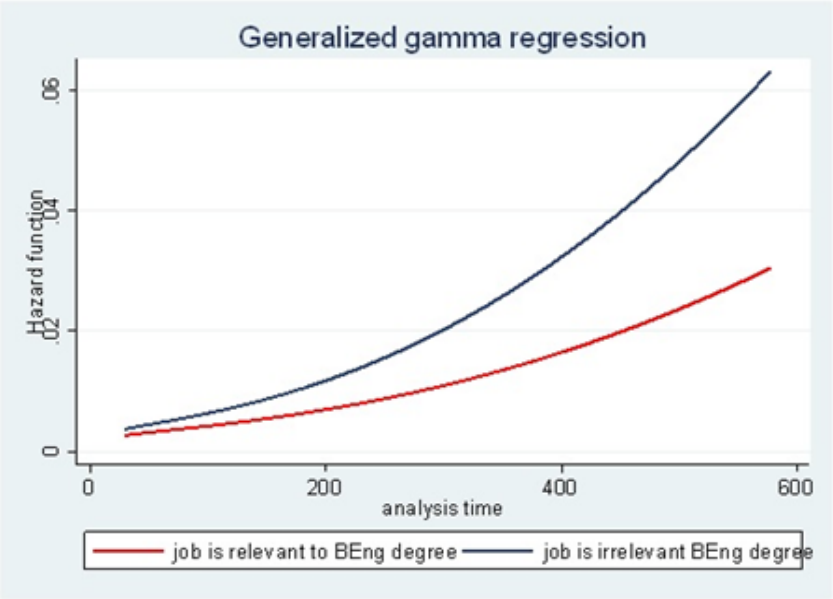
	Importance in choice of program	Men	Women
1	Future employment opportunities	99%	98%
2	Personal interest	97%	98%

Table 12: The main sources funding for post-secondary education for BEng graduates, (NGS 2013).

The main sources funding post-secondary education	Men	Women
Parents	45%	58%
Student loan	35%	30%
Other: line of credit, personal savings, employer, first nation band/treaty	20%	12%

A graph for article #1

Graph 5: Hazard function for BEng graduates by the job relevance to engineering program, NGS (2013).



Appendix C. Confirmation of Article Submissions

1.
Gender, Work & Organization - Manuscript ID GWO-19-011
1 message

Kamali Arumugam <onbehalfof@manuscriptcentral.com> Wed, Jan 9, 2019 at 9:13 PM

Reply-To: gwooffice@wiley.com
To: v*****@gmail.com
Cc: v*****@gmail.com

09-Jan-2019

Dear Ms. Osten:

We are pleased to acknowledge receipt of your paper.

"Gender Differences in the Search for First Job by New Engineers in Canada" by Osten, Victoria; Rippey, Phyllis; Denis, Ann, has been successfully submitted online and is presently being considered by the editors for review in Gender, Work & Organization.

Co-authors: Please contact the Editorial Office as soon as possible if you disagree with being listed as a co-author for this manuscript.

Your manuscript ID is GWO-19-011.

Please mention the above manuscript ID in all future correspondence or when calling the office for questions. If there are any changes in your street address or e-mail address, please log in to ScholarOne Manuscripts at https://mc.manuscriptcentral.com/gwo and edit your user information as appropriate.

You can also view the status of your manuscript at any time by checking your Author Center after logging in to https://mc.manuscriptcentral.com/gwo.

Thank you for submitting your manuscript to Gender, Work & Organization.

Sincerely

Kamali Arumugam
Gender, Work & Organization Editorial Office

2.

JWM-29799. Begell House Online Submission System - confirmation
3 messages

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journals@submission.begellhouse.com <journals@submission.begellhouse.com> Mon, Dec 24, 2018 at 3:50 PM

To: v*****@gmail.com

Dear Victoria Osten.
This is a confirmation notice that your article "Gender Differences in Job Satisfaction of BEng graduates in Canada" for the journal "Journal of Women and Minorities in Science and Engineering" has been successfully submitted and sent to the Editor-in-Chief - Kimberly Douglas-Mankin.

Please use the submission site to track the status of your article. The article ID is "JWM-29799".

Begell House
Online Submission.

3.

[CJS] Submission Acknowledgement 29539
1 message

Dr. Kevin Haggerty <cjscopy@ualberta.ca> Tue, Jan 29, 2019 at 10:12 PM
To: "Ms. Victoria Osten"

Ms. Victoria Osten:

Thank you for submitting the manuscript, "Gender Differences in Organizational Commitment among Early Career Engineers in Canada" to Canadian Journal of Sociology. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Manuscript URL:
https://journals.library.ualberta.ca/cjs/index.php/CJS/author/submission/29539

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Dr. Kevin Haggerty
Canadian Journal of Sociology
