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Original Article

Employment and Wage Gaps Among Recent Canadian Male and Female Postsecondary Graduates

Anthony Jehn[a], David Walters[b] and Stephanie Howells[b]

[a]Sociology Department, University of Western Ontario, 1151 Richmond Street, London, ON N6A 3K7, Canada.

E-mail: ajehn2@uwo.ca

[b]University of Guelph, Guelph, ON, Canada.

E-mail: dwalters@uoguelph.ca, showells@uoguelph.ca

Level of postsecondary schooling and field of study remain significant markers of social stratification. However, the extent to which these various types of postsecondary schooling influence the labor market outcomes of recent male and female graduates is unknown. Drawing on data from Statistics Canada's 2013 National Graduates Survey, we examine the employment status and gender gap in earnings among recent Canadian male and female graduates at different levels of postsecondary education and various fields of study, three years after graduation. The findings indicate substantial gender disparities in employment status across all types of postsecondary education. The gender gap in earnings is highest among trades and community college graduates, but effectively disappears for graduates with earned doctorate degrees. With respect to field of study, the gender wage gap is smallest among liberal arts graduates and largest among graduates with math-, computer science-, or engineering-related credentials. The policy implications associated with these findings should be of interest to international researchers as pay equity among men and women in the workforce remains a priority for all OECD countries.

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Introduction

The gender gap in employment outcomes has received a lot of attention within the academic research community (Bar *et al.*, 2015; Epstein *et al.*, 2015; Furno, 2014; Hughes and Maurer-Fazio, 2002; Mussida and Picchio, 2014). A review of this literature indicates that the labor market conditions for women have substantially improved in recent years (Boudarbat and Connolly, 2013; Moyser, 2017). Statistics on Canadian labor force participation rates indicate no significant gender difference over the past decade (Statistics Canada, 2019). Recent research on postsecondary

graduates has also found that young women generally experience lower unemployment rates than young men (Moyser, 2017). With respect to earnings, studies indicate an overall narrowing of the existing gender gap in pay among full-time workers by approximately 8% from 1988 to 2008 (see Baker and Drolet, 2010; Drolet, 2011). It has been said that Canada has the "most extensive pay-equity legislation in the world" (Baker and Fortin, 2001; Gunderson and Weiner, 1990); however, females consistently are found to receive lower average earnings than males (Baker and Drolet, 2010; Boudarbat and Connolly, 2013; Fortin and Schirle, 2006; Waite, 2017).

Improvements in the labor market outcomes among females have largely been attributed to their increased postsecondary educational attainment (Baker and Drolet, 2010; Boudarbat and Connolly, 2013; Epstein *et al.*, 2015; Moyser, 2017; Waite, 2017). Although women disproportionately pursue higher levels of schooling relative to men (Bayard and Greenlee, 2009; Ferguson and Wang, 2014), the highest paying fields such as mathematics, computer science, and engineering are still dominated by men (Blickenstaff, 2005; McMullen *et al.*, 2010). However, some recent evidence suggests that among the highest levels of education, women are slowly moving into some fields and occupations traditionally dominated by men (Bayard and Greenlee, 2009; England, 2011; Ferguson and Wang, 2014). This new postsecondary landscape, along with changing perceptions of women in the workplace and recent policy initiatives to promote employment equality,[1] provides some optimism regarding the employment prospects and outcomes of recent postsecondary graduates, particularly for women.

This study will provide a review of the existing literature on school-to-work transitions and the gender wage gap. Then, drawing on data from Statistics Canada's 2013 National Graduates Survey (NGS), we explore the following research questions: (1) What are the employment outcomes and earnings of recent male and female postsecondary graduates making their school-to-work transitions at the same time, assessed three years after graduation?; (2) How does gender equality in employment and earnings differ across various fields of study and levels of postsecondary schooling? and (3) To what extent do the differences identified above remain after controlling for other important predictors of labor market outcomes?

Past Canadian research examining the labor market outcomes of men and women with various postsecondary credentials has typically relied on census or survey data of the entire population, across all age cohorts. However, the most effective way to assess gender equality among postsecondary graduates is to compare the employment outcomes of recent postsecondary graduates of various levels (e.g., trades, college, university) and fields of study who make their school-to-work transitions at the same time (Boudarbat and Connolly, 2013). By assessing a single cohort of postsecondary graduates, our research is able to capture gender differences in employment outcomes which are primarily attributable to their

postsecondary educational choices (level of education and fields of study). This enables us to assess outcomes before compounding factors that contribute to gender inequality in the labor market — such as maternity, work experience, and promotion — exert their most pronounced impact. Additionally, for policy initiatives to be more effective, research is required to better understand the initial gender disparities in employment outcomes that are a result of postsecondary schooling. A substantial gender gap in employment outcomes among recent graduates becomes a strong predictor of future economic returns, which highlights the importance of focusing on the labor market outcomes of recent male and female graduates (Antonie *et al.*, 2016; Drolet, 2011).

Literature Review

Researchers have well established that human capital, particularly education and training, is an important predictor of labor market outcomes (Becker, 1964; Crook *et al.*, 2011). Originally conceptualized by Becker (1964), human capital theory suggests that personal investment in education and training generates better labor market outcomes and worker performance. Although higher education requires investing both time and resources, the positive outcomes (i.e., better occupations and wages upon graduation) are intended to offset these costs for both the individual and organizations alike (Becker, 1964; Crook *et al.*, 2011). The knowledge and skills gained through a higher education are also increasingly important for productivity, innovation, and economic growth (Becker, 1964; Ferguson and Wang, 2014).

The many labor market advantages associated with completing a postsecondary education are well documented (see Boudarbat and Connolly, 2013; Boudarbat *et al.*, 2010; Waite, 2017). Unemployment rates are lower among graduates with higher levels of education (Moyser, 2017; Waite, 2017). In fact, during the economic crisis between 2008 and 2011, unemployment rates for those with a college or undergraduate credential were less than half of those with a high school diploma or trades certificate (Ferguson and Wang, 2014). Likewise, compared to graduates with lower level credentials, research also shows that graduates with higher levels of postsecondary schooling have better labor market outcomes, such as greater economic returns (Waite, 2017; Walters, 2006). Canada has adopted the human capital model, and through its postsecondary expansionary efforts, it has become one of the most highly educated countries in the world, whereby over half the population aged 25–64 have attained some type of postsecondary education (Ferguson and Wang, 2014).

Differences in educational attainment are also closely related to gender inequality in the labor market (Boudarbat and Connolly, 2013; Waite, 2017). Recent research has found that the gender wage gap is lowest among university

graduates and highest among those with lower level credentials (England, 2011; Ferguson and Wang, 2014). These findings are somewhat encouraging, as women now significantly outnumber men with a university degree (Moyser, 2017). However, the composition of women and men at various levels of postsecondary schooling only reveals part of the story. Women are still more likely to obtain degrees in lower-paying liberal arts fields, whereas men are more likely to receive degrees in more lucrative fields such as engineering and computer science (Blickenstaff, 2005; McMullen *et al.*, 2010). Additionally, women tend to choose alternatives to STEM-related fields due to a lack of female role models in science and engineering, a "chilly climate" for women in science fields, and cultural pressures to select fields of study which conform to gender roles (see Blickenstaff, 2005, 371–372 for a review). These horizontal discrepancies may be a more pressing concern, as field of study is considered to be a significant marker of stratification in Canada (see Davies and Zarifa, 2012; Gerber and Cheung, 2008) and is very closely related to the employment outcomes of both male and female postsecondary graduates (Desjardins and King, 2011; Frenette and Frank, 2016; Waite, 2017; Walters, 2006).

There are various arguments why women have different labor market outcomes than men. One is that women invest in different types of human capital than men. Lips (2013) and Miki and Yuval (2011), for example, maintain that women may be less motivated to invest in job-specific skills, which consequently limits their potential human capital and thus, their future earnings. Supporting this position, evidence suggests that women aim for broader, more transferable skills in place of more specific forms of human capital that are particular to only one type of job (Ahmed and McGillivray, 2015; Ochsenfeld, 2014). Becker (1985) also argues that women invest in different types of human capital than men, as women anticipate shorter work periods due to childbearing and childrearing commitments. Similarly, Schulze (2015) argues that women are more likely to enroll in different types of schooling because they may experience employment interruptions, often as a result of pregnancy, and are therefore more likely to invest in general and more portable forms of human capital. As a result, women are more likely to self-select into fields of study that provide more general skills — such as arts or the humanities — whereas men are more likely to invest in specific skills obtained through fields of study such as engineering and math (Ahmed and McGillivray, 2015; Estévez-Abe, 2005). This process of self-selection may allow women to more easily reenter the labor market after an extended period of leave (Ochsenfeld, 2014; Schulze, 2015; Zafar, 2013).

Research has also identified several factors that contribute to gender inequality over the life course. In addition to the differences in educational attainment, the gender gap in employment outcomes is further perpetuated through wage penalties that disproportionately impact women. For example, women experience longer periods of job searching than men and receive less frequent wage increases and

fewer promotions, which is congruent with the glass ceiling hypothesis (Furno, 2014; Miki and Yuval, 2011; Mussida and Picchio, 2014). Often this gap is related to maternity and parenting requirements for women (Hughes and Maurer-Fazio, 2002; Lips, 2013). Becoming a parent is a key factor that can have a dramatically different impact on the career trajectories and outcomes of women and men. For example, in examining the effect of the loss of full-time experience and seniority, part of what is referred to as the "motherhood penalty," Budig and England (2001) found that women experience a wage decrease of 7% per child. In contrast, Hodges and Budig (2010) argue that a "fatherhood bonus," which describes the rise in income men receive as they increase their "breadwinning capacity" after becoming parents, can improve their wages by more than 21% and is highest among married men who are highly educated, and in professional and/or managerial positions.

Last but not least, feminist theorists maintain that labor market valuations and discrimination also contribute to the gender gap in earnings (Maume and Ruppanner, 2015; Ochsenfeld, 2014). For example, "valuative discrimination" occurs when wages are lower for occupations that are primarily held by women than those that are primarily held by men, even if the skills and credentials of the occupations are relatively equivalent (Petersen and Morgan, 1995). All of these factors can have a compounding impact on women's wages over the life course. However, our study is unique in that it can examine the labor market outcomes for graduates before most of these wage penalties and premiums having their greatest impact.

Nevertheless, the outlook for current and future graduates may be more optimistic as it is widely believed that investment in education for all — but in particular for women — and increased participation of women in the labor market have helped to reduce the gender wage gap among higher wage earners in recent decades (Gardeazabal and Ugidos, 2005; Konstantopoulos and Constant, 2008). It has also been argued that an increased participation of women in higher education will continue to promote gender equality in the labor market (Miki and Yuval, 2011; Schulze, 2015). Hence, investing in higher levels of postsecondary education increasingly becomes the predominant means of achieving more equitable employment outcomes for women (Ahmed and McGillivray, 2015; Hughes and Maurer-Fazio, 2002). Recent evidence also shows that women are making some inroads into traditionally male-dominated fields and occupations (Bayard and Greenlee, 2009; England, 2011; Waite, 2017). All of these factors should have a positive impact on gender equality in the school-to-work transitions of recent postsecondary graduates. Some recent Canadian research, drawing on National Graduate Survey (NGS) data, has examined the gender wage gap among college and undergraduate degree holders making their school-to-work transitions. For example, drawing on the 1986, 1990, 1995, 2000, and 2005 NGS, Boudarbat and Connolly (2013) examined trends in the gender wage gap of college and university undergraduate degree holders. Also using NGS data, Smith *et al.* (2017) decomposed the gender

wage gap across several cohorts of community college graduates. Although both of these studies controlled for field of study, neither assessed how field of study or level of postsecondary schooling moderates the relationship between gender and employment outcomes. Thus, our research provides a more comprehensive assessment of how gender intersects with various layers of postsecondary education in influencing employment outcomes of recent postsecondary graduates than is available in the recent literature.

Postsecondary education: the Canadian context

It is important to note to audiences in the US and abroad that postsecondary education in Canada is structured differently than in the United States. In Canada, universities are 3- or 4-year degree programs, which are commonly referred to as colleges in the US. The term "college" in Canada typically refers to community colleges (also called junior colleges in the US) which are nonbachelor's degree granting postsecondary institutions that offer 1- or 2-year programs leading to a college diploma. Similar to the US, some community colleges in Canada offer transfer programs that allow students to transfer some or all of their community college credits toward a university level degree.

In general, the postsecondary system is also much more egalitarian in Canada than in the US. Tuition at both community colleges and universities in Canada is generally much lower than their public counterparts in the US. In Canada, admission to both community colleges and university undergraduate degree programs is based primarily on GPA, whereas applicants are typically only required to complete standardized tests for admission to professional degree programs (e.g., law, medicine, dentistry etc.,).

Considering that both level of postsecondary schooling (e.g., trades, college, university) and field of study are significant markers of social stratification in Canadian society, research examining the labor market outcomes of recent male and female postsecondary graduates should account for both. The most recent Canadian research we were able to find that examines the school-to-work transitions of male and female postsecondary graduates at various levels and fields of study is based on data collected in 1995. The results of the study revealed a substantial gender gap in earnings across all levels of schooling and fields of study (see Walters, 2006). However, there have been significant changes in the political, business, and employment environments since that time that may potentially influence the gender gap in earnings and employment (Hall and Arnold, 2014). Likewise, gender pay equity in the workforce has been a priority among policy makers for the last two decades while businesses and organizations have been strongly encouraged to promote equal pay for equal work within the workforce (Clarke, 2014; Hakim, 2006; Taneja *et al.*, 2012). Furthermore, as the composition of men and women in various forms of postsecondary schooling has also changed

over the past few decades, it is important to re-examine the gender gap in employment outcomes among recent graduates of various postsecondary programs.

Drawing on data from a large national survey of recent Canadian graduates, this study will contribute to the existing body of literature by comparing employment status and earnings for recent male and female graduates of different levels of postsecondary schooling and fields of study. By examining the gender gap in employment outcomes shortly after graduation, we are able to assess the earnings of male and female postsecondary graduates before the factors relating to maternity and occupational commitment have their most significant impact since, as we have mentioned above, these factors can dramatically influence the employment and earnings outcomes of men and women. The findings will be informative to institutional officials and policy makers interested in understanding which postsecondary programs produce the most equitable outcomes for recent male and female graduates. As most postsecondary institutions in Canada are publicly funded, and all of the respondents surveyed for this study graduated from publicly funded institutions, this research will be informative to stakeholders in countries with similarly structured postsecondary systems. Finally, the results of this study will also provide current and future students with a recent snapshot of the expected returns on investment in various forms of human capital for young men and women.

Methods

Data

Our analyses are based on data from the 2013 National Graduate Survey (NGS), which was assessed at one of Statistics Canada's Research Data Centers. The NGS is a cross-sectional survey designed to collect information from a nationally representative sample of Canadian public postsecondary graduates. The survey includes information on educational attainment, such as various postsecondary credentials and fields of study, as well as employment status and earnings since graduation. The 2013 NGS includes 28,715 respondents from the 2009/2010 academic year who were surveyed three years following graduation. The NGS is the most extensive survey available in Canada relating to the school-to-work transitions of postsecondary graduates. The survey was conducted by computer-assisted telephone interviewing (CATI) and is representative of all the provinces and territories within Canada. The response rate is approximately 50% of the targeted sample.

The analytic sample for this study excludes graduates with advanced undergraduate and professional degrees, such as medicine and law, as these fields typically receive significantly higher earnings than most other fields of study (Ferguson and Wang, 2014; Waite, 2017).[2] Our sample is also restricted to

graduates residing across the ten Canadian provinces that reported valid answers for their employment status and annual earnings. After these exclusions, the final sample size for the analyses is 21,610 respondents.

Measures

Outcome variables

The first response variable in our regression models is employment status, which consists of three categories: unemployed, part-time employment, and full-time employment.[3] The response variable for the second series of regression models is yearly income reported by respondents who indicated that they were working full-time at the end of the survey, which was assessed using the natural logarithm of the annual earnings to normalize the distribution of earnings in the linear regression models.

Explanatory variables

The focal explanatory variables in this study include gender, level of education, and field of study. The two categories for the gender variable include males (treated as the reference category) and females. The level of education variable consists of five categories, including trades certificate (treated as the reference category), college diploma, undergraduate degree, master's degree, and doctorate degree. The field of study variable consists of seven categories: education, arts/humanities, social science (treated as the reference category), science, math/computer science/engineering, health, and others.[4] These fields of study categories are consistent across all levels of education.

Although there is not a universally acceptable group of control variables when assessing gender inequality (see Drolet, 2002, 32), our analyses include several common factors relating to personal characteristics and sociodemographic controls (e.g., age, age-square,[5] marital status, province of residence, presence of children), as well as our focal variables of education level and field of study (see Boudarbat and Connolly, 2013 who use these control variables in their analyses using NGS data). We used measures for parental education, and whether the respondents had received government student loans to help subsidize the cost of schooling, as proxies for parental socioeconomic status. We also included other important markers of stratification in the Canadian labor market, including immigrant status (see Frank *et al.*, 2013) and visible minority status (see Hou and Coulombe, 2010), as explanatory control variables. As prior research has found that bilingual workers earn significantly more than their monolingual counterparts, even in cases where the employee did not utilize the two languages in the workplace (see Christofides and Swidinsky, 2010), we also included a variable to capture bilingualism.[6] Finally, we included a measure for disability status, which has also recently been identified as an important predictor of the earnings and employment outcomes of

postsecondary graduates making their school-to-work transitions in Canada (see Zarifa *et al.*, 2015).

Disability status is a dichotomous variable, assessing whether a respondent has a disability or does not have a disability. The time to degree variable assesses duration in postsecondary education based on a respondent's enrollment year and graduation year. The parental education variable identifies whether or not respondents have at least one parent with an undergraduate degree. We include measures assessing the use of student loans, including both government and other sources of loans, which are dichotomized into a binary variable. Marital status consists of three categories: married, previously married, and single. Some "yes/no" binary variables include the presence of dependent children, minority status, immigrant status, and bilingualism. Age of respondents is assessed as a continuous measure. The region variable assesses the respondent's region of residence and consists of the following five categories: Atlantic Region, Quebec, Ontario (treated as the reference category), Prairie Region, and British Columbia.[7] As mentioned above, these are included as control variables in our models because they have all been identified as important predictors of labor market outcomes in prior research examining the school-to-work transitions of postsecondary graduates in Canada (see Walters and Zarifa, 2008). A further description of these variables is provided in Table 1.

Statistical analysis

We first determine weighted gender-stratified study sample characteristics in order to assess baseline significant differences in employment status, income, and educational attainment, including level and field of study. Then, in order to examine the employment status among recent male and female graduates, we estimate a series of multinomial logistic regression models, where unemployment represents the baseline (comparison) category across each model. The first model includes the focal explanatory variables gender, level of education, and field of study, as well as controls for the remaining theoretically relevant covariates. The second model includes an interaction between gender and level of education, followed by an interaction between gender and field of study. The second series of regression models are used to assess the gender gap in earnings among full-time workers. Focusing on full-time employees restricts our analyses to similar types of workers and makes men and women in the sample more comparable (see Boudarbat and Connolly, 2013, 1046). These models are estimated via ordinary least squares (OLS) regression. The first of these models includes the focal explanatory variables gender, level of education, and field of study, as well as the covariates. The second model adds the interaction between gender and level of education, while the third model includes an interaction between gender and field of study.

Table 1 Descriptive statistics by gender

	Male (N = 9454)	*Female (N = 12,156)*	*Difference*
Employment status (%)			***
Unemployed	5.8	5.0	
Part-time employment	7.5	16.0	
Full-time employment	86.7	79.0	
Income (mean)	$47,000	$39,000	***
Level of education (%)			***
Trades	14.2	7.2	
College	33.3	33.2	
Undergraduate	41.5	47.0	
Masters	9.0	11.1	
Doctorate	2.0	1.5	
Field of study (%)			
Arts/humanities	8.2	12.3	***
Sciences	4.5	4.2	
Health	6.5	21.7	
Social sciences	10.8	16.9	
Other	31.9	30.1	
Math/comp/eng	34.5	5.3	
Education	3.6	9.6	
Disability status (%)			
Has disability	4.6	4.9	
Time to completion (mean)	2.9	2.9	*
Parental education (%)			***
Undergraduate degree	42.1	36.8	
Student loans (%)			
Has student loans	39.6	46.2	
Government loans (%)			**
Has government loans	31.9	35.6	
Other loans (%)			
Has other loans	25.5	25.7	
Age (mean)	30.6	31.0	
Marital status (%)			***
Married	44.3	49.3	
Previously married	2.0	4.1	
Single	53.7	46.6	
Dependent children (%)			***
Has dependent children	21.0	25.0	
Region (%)			***
Atlantic region	5.3	6.5	
Quebec	34.0	29.3	
Ontario	34.9	38.5	
Prairie region	14.6	15.1	
British Columbia	11.2	10.6	
Language (%)			*
Bilingual	33.1	29.8	
Immigrant status (%)			***
Immigrant	17.1	12.7	
Minority status (%)			*
Minority	23.1	20.6	

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Results

Table 1 provides the descriptive statistics for all of the variables in this study. For the purposes of this study, only the results relating to the focal variables are discussed. Unemployment rates are comparable for both recent male and female postsecondary graduates; however, significant gender differences are observed among the employed categories ($p < 0.001$).[8] A substantially higher percentage of recent male graduates are employed full-time (approximately 87%) compared to females with 79% full-time employment. Conversely, females are twice as likely to be employed part-time (approximately 16% compared to 8% among males). With respect to earnings, significant gender differences are observed as the average income for males is approximately $8000 more than females ($p < 0.001$),[9] which may be a result of the observed disparities in employment status.

Females are more likely than males to receive undergraduate degrees (47% compared to 42%) and master's degrees (11% compared to 9%), whereas males are more likely to graduate with a trades certificate (approximately 14% compared to 7%). With respect to field of study, our results are consistent with previous research that males are more heavily concentrated in technical and applied fields (Blickenstaff, 2005; McMullen *et al.*, 2010). In fact, the gap is very pronounced. Approximately 34% of recent male graduates received credentials in math-, computer science-, or engineering-related programs in comparison with approximately 5% of female graduates. In contrast, higher percentages of females obtained credentials in fields of study that provide more general skills, including arts and humanities, social science, and education. A substantially higher percentage of females also receive health-related credentials compared to their male counterparts (approximately 22% compared to 7% among males).

Table 2 provides the multinomial logistic regression estimates for employment status with unemployment as the baseline category of the response variable. The first model examines the relationship between the focal explanatory variables gender, level of education, and field of study, controlling for the other variables in the model. The second model includes an interaction between gender and level of education, while the third model includes an interaction between gender and field of study. In order to highlight the effects of the key variables gender, level of schooling, and field of study, we have omitted the estimates for the control variables from the table. They are available upon request. Moreover, since the interactions between gender and level of education (Model 2) and gender and field of study (Model 3) are statistically significant ($p < 0.001$),[10] we do not interpret the estimates for these variables from Model 1, but they can be viewed in the table.

To provide a more readable interpretation of the multinomial logistic regression estimates relating to the interaction involving gender and level of schooling from Model 2, we converted these estimates into predicted probabilities and plotted them as an effects display in Figure 1. The predicted probabilities are calculated holding

Table 2 Multinomial logistic regression — employment status

	Model 1		*Model 2*		*Model 3*	
	Part-time	*Full-time*	*Part-time*	*Full-time*	*Part-Time*	*Full-time*
Female	1.74***	0.96	4.07***	1.28	1.26	0.72
Level of education						
Trades	-	-	-	-	-	-
College	1.43	1.66**	2.40**	1.83**	1.42	1.68**
Undergraduate	1.39	1.92*	2.41*	2.31**	1.38	1.94**
Masters	1.55	2.45***	2.77**	2.39**	1.53	2.48***
Doctorate	1.18	1.68	1.46	1.79	1.16	1.73
Field of study						
Arts/humanities	0.58*	0.58*	0.87	0.58*	0.66	0.45*
Sciences	0.55*	0.55*	0.64	0.56*	0.58	0.43*
Health	1.83*	1.83*	1.29	1.80*	1.22	1.13
Social sciences	-	-	-	-	-	-
Other	0.47**	1.00	0.47**	0.99	0.35*	0.85
Math/comp/eng	0.23***	0.94	0.25***	0.96	0.17***	0.78
Education	0.54*	0.56*	0.55*	0.57*	0.28*	0.35*
Interactions						
Female*trades			-	-		
Female*college			0.39*	0.76		
Female*undergraduate			0.37*	0.65		
Female*masters			0.38*	0.93		
Female*doctorate			0.64	0.81		
Female*arts/humanities					1.48	1.46
Female*sciences					1.14	1.50
Female*health					1.19	1.91
Female*social sciences					-	-
Female*other					1.53	1.23
Female*math/comp/eng					1.82	1.24
Female*education					2.42	1.93
Observations	21,610		21,610		21,610	

Exponentiated coefficients. All models control for the theoretically relevant control variables. Models include sampling weights to account for unequal probability of selection into the sample.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

the control variables constant at typical values.[11] The quantitative variables (i.e., age, age squared, time to completion) are held constant at their means, whereas proportions are used for the categorical variables (see Fox and Andersen, 2006). The results in Figure 1 reveal that female graduates are almost consistently (excluding master's degrees) more likely to be working part-time than their male counterparts. In addition, at almost all levels of education, female graduates are significantly less likely to be working full-time than males, except master's degree holders, where there is no significant difference between males and females.

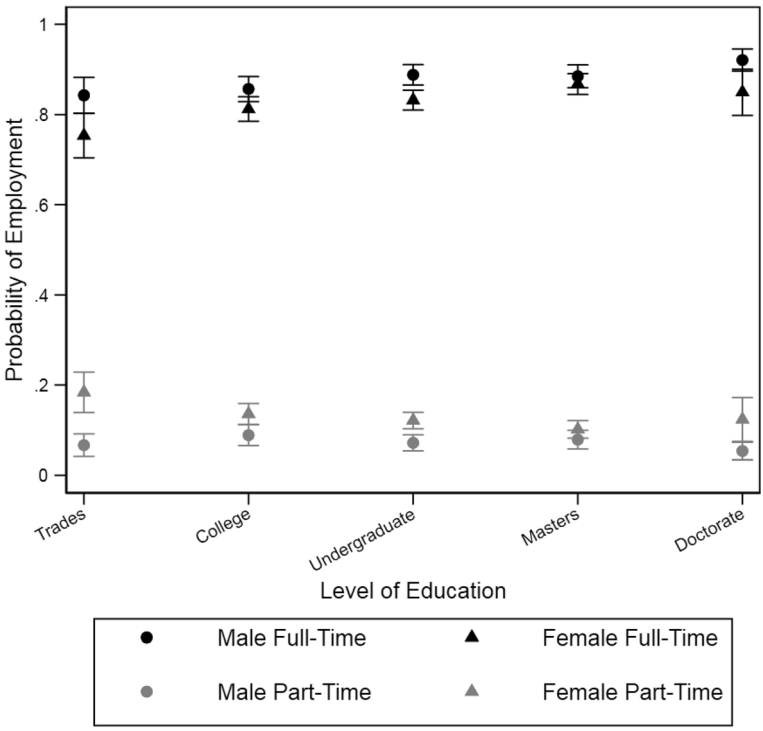

Figure 1. Employment outcomes for sex*level of education.

Figure 2 represents the predicted probabilities of employment for the interaction between gender and field of study. The results indicate that female graduates are significantly more likely than their male counterparts to work part-time across several fields of study including arts and humanities, social science, education, and fields classified as "other." Moreover, significant gender differences in full-time employment are observed for fields of study related to fine arts and humanities, social science, and fields classified as "other," where females are less likely to be employed full-time than males.

Table 3 provides the OLS regression estimates predicting earnings for postsecondary graduates employed full-time, three years after graduation. The first model examines the relationship between the natural logarithm of income and the focal explanatory variables gender, level of education, and field of study, while controlling for the remaining covariates. The second model includes an interaction between gender and level of education, and the third and final model includes an interaction between gender and field of study.

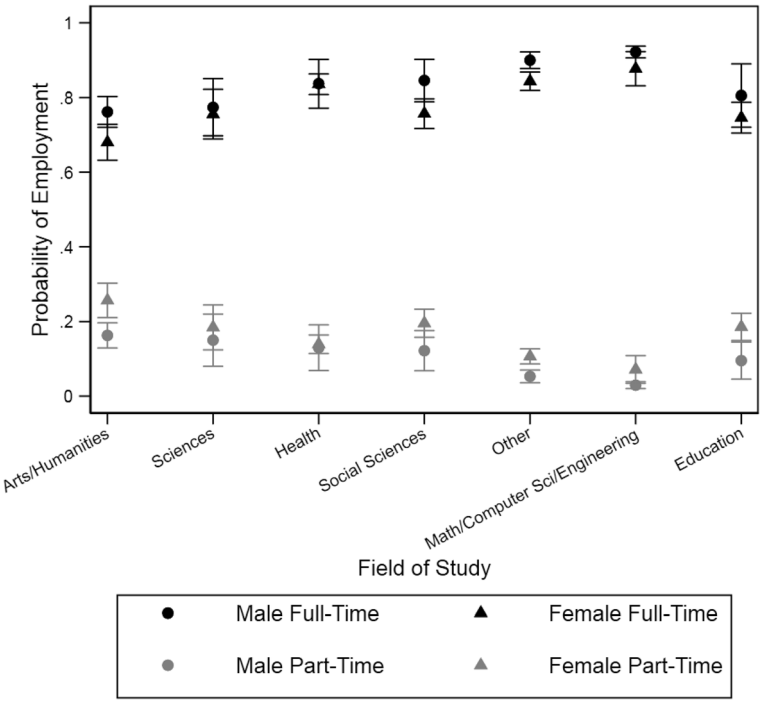

Figure 2. Employment outcomes for sex*field of study.

As was the case with the multinomial logistic regression models, in the interest of space only the estimates relating to the key variables gender, level of schooling, and field of study are interpreted below. Moreover, since the interactions between gender and level of education (Model 2) and gender and field of study (Model 3) are statistically significant ($p < 0.001$),[12] we do not interpret the estimates for these variables from Model 1, but they are displayed in Table 3.

Like the multinomial logistic regression results, for ease of interpretation, the regression estimates for the interaction models are converted into meaningful quantities (in this case, dollars), while holding the independent control variables constant at typical values. The predicted earnings for the interaction between gender and level of education, along with corresponding 95% confidence intervals, are plotted in Figure 3. The estimates in Figure 3 reveal that graduates with advanced credentials report the highest earnings, although men typically earn significantly more than women ($p < 0.001$). The gender gap in earnings is highest among graduates with either a trades certificate or college-level credential. For example, male graduates with a trades certificate have predicted earnings of

Table 3 Ordinary least squares (OLS) regression — log of earnings

	Model 1	*Model 2*	*Model 3*
Female	− 0.12***	− 0.22***	− 0.11**
Level of education			
Trades	-	-	-
College	0.13***	0.12**	0.13***
Undergraduate	0.37***	0.31***	0.37***
Masters	0.58***	0.53***	0.59***
Doctorate	0.63***	0.53***	0.64***
Field of study			
Arts/humanities	− 0.10***	− 0.10***	− 0.13**
Sciences	− 0.06*	− 0.06*	− 0.07
Health	0.22***	0.22***	0.17**
Social sciences	-	-	-
Other	0.09***	0.09***	0.10*
Math/comp/eng	0.24***	0.23***	0.25***
Education	0.01	0.01	0.00
Interactions			
Female*trades		-	
Female*college		0.06	
Female*undergraduate		0.14**	
Female*masters		0.13*	
Female*doctorate		0.23***	
Female*arts/humanities			0.06
Female*sciences			0.01
Female*health			0.06
Female*social sciences			-
Female*other			− 0.02
Female*math/comp/eng			− 0.06
Female*education			0.01
Constant	10.50***	10.50***	10.50***
Observations	16,815	16,815	16,815
Adjusted R^2	0.211	0.213	0.211

Regression coefficients. All models control for the theoretically relevant control variables. Models include sampling weights to account for unequal probability of selection into the sample.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

approximately $40,500 three years after graduation, whereas female graduates with the same level of education earn approximately $32,500.[13]

Figure 3 also reveals that the gap in full-time earnings typically becomes smaller as level of education increases. The most interesting finding observed in this display is that the difference in earnings among male and female full-time workers with doctoral degrees is not statistically significant, three years after graduation. In fact, the reported earnings of males and females three years after graduation are almost identical. This is the only level of education where there does not appear to be a gender gap in earnings among recent postsecondary graduates.

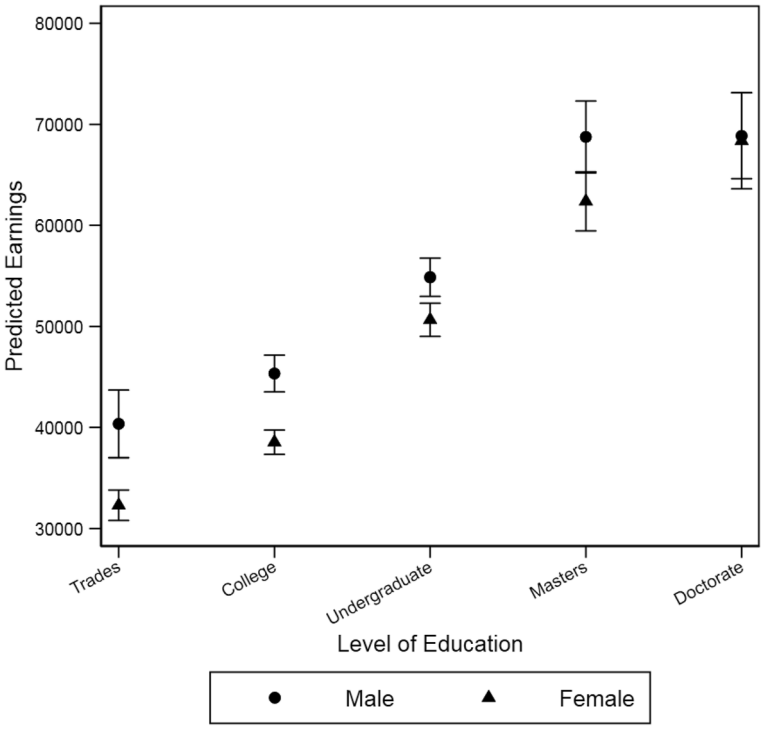

Figure 3. Predicted full-time earnings for sex*level of education.

Model 3 includes the interaction between gender and field of study, which is statistically significant ($p < 0.001$). As with Model 2, the regression estimates for the interaction in Model 3 were also converted into predicted earnings (dollars), holding the independent control variables constant at typical values, and plotted along with corresponding 95% confidence intervals (see Figure 4). The results in the display indicate that graduates of liberal arts and the sciences report the lowest overall earnings (liberal arts: $40,500 for men and $38,500 for women; sciences: $43,000 for men and $38,500 for women). In contrast, graduates of technical and applied fields including math, computer science, engineering, and health report the highest overall earnings (math, computer science, and engineering: $60,000 for men, $50,500 for women; health: $55,500 for men, $52,500 for women). Interestingly, the largest gender disparity in earnings is observed for postsecondary graduates with math-, computer science-, or engineering-related credentials; however, there is not a significant gender gap in earnings among graduates of liberal arts-, education-, or health-related fields.

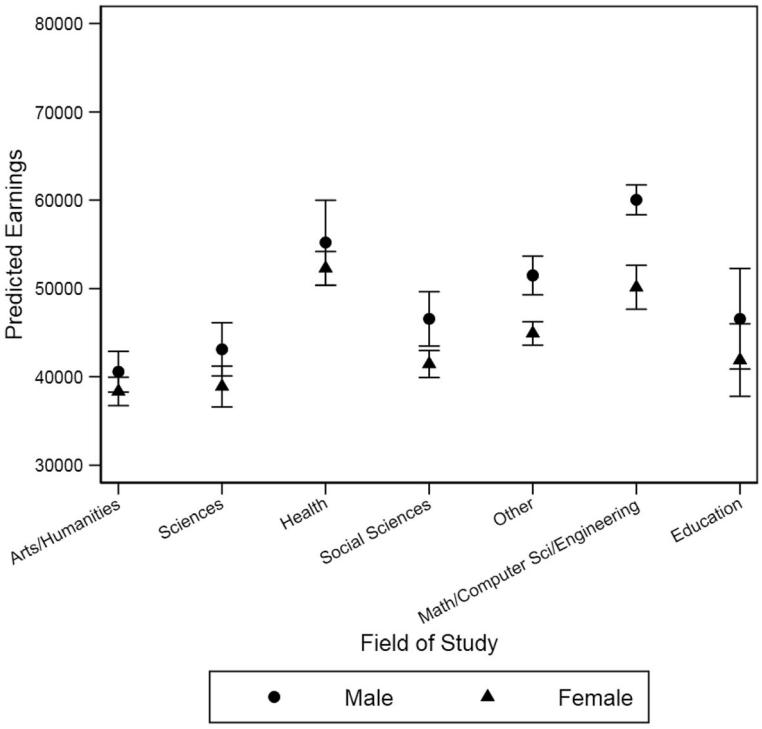

Figure 4. Predicted full-time earnings for sex*field of study.

Discussion

The key purpose of this study was to contribute to the existing body of literature by examining gender differences in employment status and full-time earnings among recent graduates of different levels of education and fields of study, while controlling for various personal and sociodemographic characteristics. The results provide a number of interesting findings that will have important implications for policy makers and institution officials, as well as current and future graduates navigating the postsecondary education system.

With respect to field of study, prior research indicates that graduates of liberal arts programs typically report the lowest earnings, while graduates of technical and applied fields typically receive the highest (see Davies and Zarifa, 2012; Gerber and Cheung, 2008). Likewise, our results indicate that males earn significantly more than females with postsecondary credentials in fields of study that tend to have the highest overall incomes (e.g., engineering); however, we would like to emphasize that we did not find a significant gender gap in earnings among

graduates of liberal arts-, education-, and health-related fields, when controlling for the other variables in our study.

Comparing the employment outcomes of male and female graduates across levels of postsecondary schooling, our results reveal a significant gender gap in full-time earnings among trades, community college, undergraduate, and master's degree holders, even after controlling for other important predictors of earnings. However, it is worth highlighting that women with doctoral degrees who are employed full-time three years after graduation earn more than their equivalents who hold a master's degree, whereas men with doctoral degrees earn approximately the same as their equivalents who hold a master's degree.

Perhaps the most noteworthy finding of this study is that the earnings of female and male postsecondary graduates with doctoral degrees who are working full-time three years after graduation are virtually identical. This finding is consistent with research in the US which suggests that the gender gap in earnings has converged among workers in the upper end of the educational distribution (see England, 2011). It is also similar to findings in a recent policy report from Statistics Canada (Ferguson and Wang, 2014), revealing that men and women with earned doctorates have comparable earnings. We speculate that this might be attributed to the significant portion of PhD graduates that are working in public sector organisations with stronger labor standards and collective agreements aimed at reducing the gender wage gap (Gardeazabal and Ugidos, 2005; Konstantopoulos and Constant, 2008), and where gender equity laws are more effective and readily enforced than smaller private sector organizations (see Baker and Fortin, 2001 for a discussion).[14] Likewise, universities continue to be a significant source of employment for PhD graduates and many have implemented extensive policies aimed at promoting gender employment equity (see, for example, Bakker *et al.*, 2010; Campbell *et al.*, 2005). Additional research is required to better understand the occupational outcomes of female and male doctoral graduates.

Although our finding that females with doctoral degrees have reached earnings parity with men if they are employed full-time is promising for Canada's most highly educated graduates, the results from our employment status analyses suggest that the glass is still only half full. Recent female graduates with earned doctorates are still significantly more likely than their male counterparts to be employed part-time. Interestingly, this pattern is reversed among master's degree holders, where a master's degree is an equalizer for women with respect to employment status but not earnings. Although recent female graduates with a master's degree still report significantly lower earnings than equivalent male graduates, they are not significantly less likely than their male counterparts to be employed full-time, nor are they significantly more likely to be employed part-time, three years after graduation.

These findings are intriguing and will certainly require a follow-up when additional waves of Statistics Canada's National Graduate Survey are released.

Likewise, future research will benefit by examining employment trajectories to determine whether earnings parity experienced by recent female and male doctoral graduates, who are employed full-time three years after graduation, is maintained throughout their careers. Finally, since professional degree holders represent a very heterogeneous group in terms of their schooling and employment opportunities, we opted to exclude them from this analysis. Researchers examining the school-to-work transitions of male and female postsecondary graduates may wish to explore this group in the future.

In sum, it is clear from the totality of our findings that more work needs to be done to equalize the employment outcomes for postsecondary graduates of all levels of schooling and fields of study. Employers may need to implement stronger policies aimed at reducing the persistent gender pay gaps that exist within much of the Canadian labor market, in spite of Canada's advanced pay equity legislation. We anticipate that researchers and policy analysts in other developed countries will be interested in this research for comparative purposes. While our findings are based on Canadian data, the results are informative to researchers, policy makers, and institutional officials across developed nations where gender differences in employment and pay are pressing concerns among policy makers. Likewise, the findings also provide a frame of reference for policy analysts who might be interested in replicating our research abroad, particularly in countries such as the US where a significant segment of postsecondary schooling is privately funded. Finally, we hope that these findings will be useful to policy makers and postsecondary institution officials interested in the recent employment outcomes of male and female postsecondary graduates with various types of postsecondary credentials.

Compliance with Ethical Standards

Conflict of interest The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Notes

1 In 1988, the Government of Ontario passed the Pay Equity Act, which has been heralded as "the world's most progressive equal pay for work of equal value legislation" (Singh and Peng, 2010). Although other provinces—including Manitoba, Nova Scotia and Prince Edward Island—also have pay equity acts for their public sector employees, Ontario's Act covers both the private sector and public sector employers with ten or more employees and requires that pay equity be maintained (McDonald and Thornton, 2015). However, not all Canadian provinces have pay-equity legislation: British Columbia, Newfoundland and Labrador, Alberta and Saskatchewan do not have legislation that ensures equal pay for work of equal value (McDonald and Thornton, 2015). In October 2018, the

Liberal Canadian Federal Government announced legislation designed to equalize pay for men and women nationwide. This Pay Equity Act requires that the pay guidelines be implemented within three years and applies to federal sectors, such as the federal private and public sector, and any Parliamentary workplaces and Ministers' offices.

2 Conventional practice in research utilizing the NGS data has been to adopt the original educational classification codes from the survey, where undergraduate and first professional degrees are grouped together. Under this coding scheme, graduates with law degrees (LLBs) are grouped with graduates with social science undergraduate degrees. Likewise, graduates with professional degrees in medicine, dentistry, nursing, etc., are grouped together with the other undergraduate degree holders in health-related fields. However, the outcomes of these varied degrees are dramatically different.

3 The employment status variable excludes those respondents who reported that they are not in the labor market.

4 The "other" category includes interdisciplinary fields that could not be easily classified, such as Personal Improvement and Leisure, and Personal, Protective, and Transportation Services.

5 We included orthogonal polynomial contrasts to minimize the collinearity among the age estimates.

6 In Canada, bilingualism implies that the respondent is fluent in both English and French.

7 As some Canadian provinces are smaller than others, Atlantic Region includes four provinces: Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick. Prairie Region includes three provinces: Alberta, Saskatchewan, and Manitoba.

8 Chi-square tests are used for categorical variables, and *t* tests are used for quantitative variables (e.g., earnings, time to graduation, age).

9 Statistical significance is indicated at the $p < 0.001$ level unless otherwise stated.

10 A test for the three-way interaction among gender, level of schooling, and field of study was not statistically significant.

11 The predicted probabilities are calculated using the following formula:
$\widehat{\Pr}(y = m|\mathbf{x}) = \frac{\exp(\mathbf{x}\hat{\beta}_{m|J})}{\sum_{j=1}^{J}\exp(\mathbf{x}\hat{\beta}_{j|J})}$ where m represents a category of the dependent variable, employment status, and J represents the total number of categories of the dependent variable. $\mathbf{x}$ represents a vector of values for independent variables, where the predicted probabilities for a particular x_k (i.e., gender, level of schooling, and gender*level of schooling) are obtained by holding all variables except for x_k constant at their means or proportions (see Long and Freese, 2014).

12 A test for the three-way interaction among gender, level of schooling, and field of study was not statistically significant.

13 All estimates are rounded to the nearest hundredth.

14 Hou and Coulombe (2010) come to similar conclusions in comparing visible minorities with non-visible minorities.

References

Ahmed, S. and McGillivray, M. (2015) 'Human capital, discrimination, and the gender wage gap in Bangladesh', *World Development* 67: 506–524.

Antonie, L., Plesca, M. and Teng, J. (2016) Heterogeneity in the Gender Wage Gap in Canada. Discussion Paper 2016-03, Guelph: University of Guelph, available on http://www.uoguelph.ca/economics/repec/workingpapers/2016/2016-03.pdf.

Baker, M. and Drolet, M. (2010) 'A new view of the male/female pay gap', *Canadian Public Policy* 36(4): 429–464.

Baker, M. and Fortin, N.M. (2001) 'Occupational gender composition and wages in Canada, 1987–1988', *Canadian Journal of Economics/Revue Canadienne d'économique* 34(2): 345–376.

Bakker, K., Boyd, L., Fortin, N., Johnson, J., Patch, T., Trowell, M. and Sudmant, W. (2010) An analysis of the gender pay gap in professorial salaries at UBC. Report of the pay equity (data) working group, Vancouver: University of British Columbia, available on https://www.facultyassociation.ubc.ca/assets/media/GenderPayEquity_Report_DATA.pdf.

Bar, M., Kim, S. and Leukhina, O. (2015) 'Gender wage gap accounting: the role of selection bias', *Demography* 52(5): 1729–1750.

Bayard, J. and Greenlee, E. (2009) *Graduating in Canada: profile, labour market outcomes and student debt of the class of 2005*, Ottawa: Statistics Canada, available on https://www150.statcan.gc.ca/n1/en/pub/81-595-m/81-595-m2009074-eng.pdf?st=VlKIDSXD.

Becker, G.S. (1964) *Human capital: a theoretical and empirical analysis, with special reference to education*, New York, NY: Columbia University Press.

Becker, G.S. (1985) 'Human capital, effort, and the sexual division of labor', *Journal of Labor Economics* 3(1, Part 2): S33–S58.

Blickenstaff, J.C. (2005) 'Women and science careers: leaky pipeline or gender filter?', *Gender and Education* 17(4): 369–386.

Boudarbat, B. and Connolly, M. (2013) 'The gender wage gap among recent post-secondary graduates in Canada: a distributional approach', *Canadian Journal of Economics/Revue Canadienne d'économique* 46(3): 1037–1065.

Boudarbat, B., Lemieux, T. and Riddell, W.C. (2010) 'The evolution of the returns to human capital in Canada, 1980–2005', *Canadian Public Policy* 36(1): 63–89.

Budig, M.J. and England, P. (2001) 'The wage penalty for motherhood', *American Sociological Review* 66(2): 204–225.

Campbell, K., Chelladurai, R., Darnell, R., Handford, P., Koval, J., Macfie, S. and Schroeder, J. (2005) *Report of the faculty pay equity committee*, London, ON: The University of Western Ontario.

Christofides, L.N. and Swidinsky, R. (2010) 'The economic returns to the knowledge and use of a second official language: English in Quebec and French in the Rest-of-Canada', *Canadian Public Policy* 36(2): 137–158.

Clarke, R.J. (2014) 'Forging a gender-balanced economy', *The OECD Observer* (300): 21.

Crook, T.R., Todd, S.Y., Combs, J.G., Woehr, D.J. and Ketchen Jr, D.J. (2011) 'Does human capital matter? A meta-analysis of the relationship between human capital and firm performance', *Journal of Applied Psychology* 96(3): 443.

Davies, S. and Zarifa, D. (2012) 'The stratification of universities: structural inequality in Canada and the United States', *Research in Social Stratification and Mobility* 30(2): 143–158.

Desjardins, L. and King, D. (2011) *Expectations and labour market outcomes of doctoral graduates from Canadian Universities*, Ottawa, ON: Statistics Canada.

Drolet, M. (2002) 'Can the workplace explain Canadian gender pay differentials?', *New Zealand Economic Papers* 36(1): 75–77.

Drolet, M. (2011) 'Why Has the Gender Wage Gap Narrowed?', *Perspectives on Labour and Income* 23(1): 5.

England, P. (2011) 'Reassessing the uneven gender revolution and its slowdown', *Gender and Society* 25(1): 113–123.

Epstein, G.S., Gafni, D. and Siniver, E. (2015) 'Even education has its limits: closing the wage gap', *Journal of Economic Studies* 42(5): 908–928.

Estévez-Abe, M. (2005) 'Gender bias in skills and social policies: the varieties of capitalism perspective on sex segregation', *Social Politics: International Studies in Gender, State and Society* 12(2): 180–215.

Ferguson, S.J. and Wang, S. (2014) Graduating in Canada: Profile, labour market outcomes and student debt of the class of 2009–2010. Report no. 201410, Ottawa, ON: Statistics Canada.

Fortin, N.M. and Schirle, T. (2006) (Gender dimensions of changes in earnings inequality in Canada,' *dimensions of inequality in Canada* 1: 307–346.

Fox, J. and Andersen, R. (2006) 'Effect displays for multinomial and proportional-odds logit models', *Sociological Methodology* 36(1): 225–255.

Frank, K., Phythian, K., Walters, D. and Anisef, P. (2013) 'Understanding the economic integration of immigrants: a wage decomposition of the earnings disparities between native-born Canadians and recent immigrant cohorts, *Social Sciences* 2(2): 40–61.

Frenette, M. and Frank, K. (2016) *Earnings of postsecondary graduates by detailed field of study,* Ottawa, ON: Statistics Canada, available on https://www150.statcan.gc.ca/n1/pub/11-626-x/11-626-x2016056-eng.htm.

Furno, M. (2014) 'Returns to education and gender gap', *International Review of Applied Economics* 28(5): 628–649.

Gardeazabal, J. and Ugidos, A. (2005) 'Gender wage discrimination at quantiles', *Journal of Population Economics* 18(1): 165–179.

Gerber, T.P. and Cheung, S.Y. (2008) 'Horizontal stratification in postsecondary education: forms, explanations, and implications', *Annual Review of Sociology* 34: 299–318.

Gunderson, M. and Weiner, N. (1990) *Pay equity: issues, options and experiences*, Toronto, ON: Butterworth-Heinemann.

Hakim, C. (2006) 'Women, careers, and work-life preferences', *British Journal of Guidance and Counselling* 34(3): 279–294.

Hall, F.L. and Arnold, H. (2014) *Intentions for and outcomes following a decade of government investment in graduate education*, Toronto, ON: Higher Education Quality Council of Ontario, available on http://www.heqco.ca/en-ca/Research/ResPub/Pages/Intentions-For-and-Outcomes-Following-a-Decade-of-Government-Investment-in-Graduate-Education-.aspx.

Hodges, M.J. and Budig, M.J. (2010) 'Who gets the daddy bonus? Organizational hegemonic masculinity and the impact of fatherhood on earnings', *Gender and Society* 24(6): 717–745.

Hou, F. and Coulombe, S. (2010) 'Earnings gaps for Canadian-born visible minorities in the public and private sectors', *Canadian Public Policy* 36(1): 29–43.

Hughes, J. and Maurer-Fazio, M. (2002) 'Effects of marriage, education and occupation on the female/male wage gap in China', *Pacific Economic Review* 7(1): 137–156.

Konstantopoulos, S. and Constant, A. (2008) 'The gender gap reloaded: are school characteristics linked to labor market performance?', *Social Science Research* 37(2): 374–385.

Lips, H.M. (2013) 'The gender pay gap: challenging the rationalizations. Perceived equity, discrimination, and the limits of human capital models', *Sex Roles* 68(3–4): 169–185.

Long, J.S. and Freese, J. (2014) *Regression models for categorical dependent variables using stata*, College Station, TX: Stata Press, available on https://www.stata.com/bookstore/regression-models-categorical-dependent-variables/.

Maume, D. J. and Ruppanner, L. (2015) 'State liberalism, female supervisors, and the gender wage gap', *Social Science Research* 50: 126–138.

McDonald, J. A. and Thornton, R. J. (2015) ' "Coercive cooperation"? Ontario's Pay Equity Act of 1988 and the gender pay gap', *Contemporary Economic Policy* 33(4): 606–618.

McMullen, K., Gilmore, J. and Le Petit, C. (2010) 'Women in non-traditional occupations and fields of study', *Education Matters* 7(1), available on https://www150.statcan.gc.ca/n1/pub/81-004-x/2010001/article/11151-eng.htm.

Miki, M. and Yuval, F. (2011) 'Using education to reduce the wage gap between men and women', *The Journal of Socio-Economics* 40(4): 412–416.

Moyser, M. (2017) *Women and paid work*; Ottawa, ON: Statistics Canada. https://www150.statcan.gc.ca/n1/pub/89-503-x/2015001/article/14694-eng.htm.

Mussida, C. and Picchio, M. (2014) 'The gender wage gap by education in Italy', *The Journal of Economic Inequality* 12(1): 117–147.

Ochsenfeld, F. (2014) 'Why do women's fields of study pay less? A test of devaluation, human capital, and gender role theory', *European Sociological Review* 30(4): 536–548.

Petersen, T. and Morgan, L. A. (1995) 'Separate and unequal: occupation-establishment sex segregation and the gender wage gap', *American Journal of Sociology* 101(2): 329–365.

Schulze, U. (2015) 'The gender wage gap among PhDs in the UK', *Cambridge Journal of Economics* 39(2): 599–629.

Singh, P. and Peng, P. (2010) 'Canada's bold experiment with pay equity', *Gender in Management: An International Journal* 25(7): 570–585.

Smith, M.R., Waite, S. and Durand, C. (2017) 'Gender differences in the earnings produced by a middle range education: the case of canadian "colleges"', *Social Science Research* 66: 140–153.

Taneja, S., Golden Pryor, M. and Oyler, J. (2012) 'Empowerment and gender equality: the retention and promotion of women in the workforce', *Journal of Business Diversity* 12(3): 43–53.

Waite, S. (2017) 'Postgraduate wage premiums and the gender wage gap in Canada', *Canadian Journal of Higher Education* 47(2): 156–187.

Walters, D. (2006) 'An examination of the school-to-work transitions of male and female college and university graduates of applied and liberal arts programs in Canada', *Higher Education Policy* 19(2): 225–250.

Walters, D. and Zarifa, D. (2008) 'Earnings and employment outcomes for male and female postsecondary graduates of coop and non-coop programmes', *Journal of Vocational Education and Training* 60(4): 377–399.

Zafar, B. (2013) 'College major choice and the gender gap', *Journal of Human Resources* 48(3): 545–595.

Zarifa, D., Walters, D. and Seward, B. (2015) 'The earnings and employment outcomes of the 2005 cohort of Canadian postsecondary graduates with disabilities', *Canadian Review of Sociology* 52(4): 343–376.