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How Do Women in Male-dominated Apprenticeships Fare in the Labour Market?

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by

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Abstract

Increasing women's participation in male-dominated trades has been identified as a means of improving the supply of skilled tradespersons in Canada, creating a more diverse workforce, and increasing women's wages. However, little information exists about women's decision to enter male-dominated apprenticeship programs and their subsequent labour market outcomes. This study addresses both information gaps by examining the characteristics associated with women selecting male-dominated apprenticeship programs and their labour market outcomes relative to men who selected the same types of programs. A range of outcomes are examined, including employment status, self-employment, obtaining a job related to the trade of study, hours worked per week, union membership, a series of job benefits (such as extended health care, sick leave, and retirement plan benefits) and hourly wages. Results indicate that women who were Canadian-born, who were older, or who had a father with a trades certificate were more likely than other female apprentices to choose a male-dominated program. Women who studied in male-dominated apprenticeship programs generally had poorer labour market outcomes than their male counterparts. Among apprentices who selected male-dominated programs, women were as likely as men to receive sick leave benefits in their jobs but received lower median hourly wages than men. Fewer gender differences were found among apprentices who selected female-dominated or mixed (neither male- nor female-dominated) programs. However, while the median wages of women who studied in female-dominated or mixed apprenticeship programs did not differ significantly from those of their male counterparts, these women did earn less than men at the higher end of the wage distribution (75th percentile).

Keywords: apprenticeship, labour market outcomes, postsecondary education, skilled trades, women

Executive summary

Although women's labour force participation increased substantially over the last several decades, women continue to be underrepresented within the skilled trades. Increasing women's participation in male-dominated trades has been identified as a means of improving the supply of skilled tradespersons in Canada, creating a more diverse labour force and increasing women's wages.

Female apprentices are concentrated in a few female-dominated programs, such as hairstylist or esthetician. Research has shown substantial differences between the wages of workers in male-dominated and female-dominated trades (Boothby and Drewes 2010); however, less is known about how women who studied in male-dominated apprenticeship programs fare compared with their male counterparts.

This study examined the characteristics associated with women selecting male-dominated apprenticeship programs and men selecting female-dominated programs. The labour market outcomes of female apprentices relative to those of men who selected the same types of apprenticeship programs were also studied. The following questions were addressed:

1. What proportion of female apprentices select male-dominated apprenticeship programs, and what proportion of male apprentices select female-dominated programs?
2. Among apprentices, what characteristics are associated with women selecting male-dominated programs and men selecting female-dominated programs?
3. What are the labour market outcomes of women who selected male-dominated apprenticeship programs relative to those of men who selected the same types of programs?

To answer these questions, this study uses the 2015 National Apprenticeship Survey (NAS), which contains a nationally representative sample of apprentices who completed or discontinued their programs in 2011, 2012 or 2013. The 2015 NAS was also linked to four years of tax data (2011 to 2014) from the T1 Family File (T1FF). Male-dominated programs were defined as those programs in which men accounted for at least 75% of apprentices. Similarly, female-dominated programs were those in which women accounted for at least 75% of apprentices. All other programs were classified as "mixed" (neither male- nor female-dominated).

Overall, just over one in five (20.7%) female apprentices were in male-dominated programs. By contrast, only 0.5% of male apprentices selected female-dominated programs. Women in male-dominated programs were concentrated in welder or other machining or metal forming, electrician, carpenter or cabinetmaker.

Results indicated that female apprentices who were Canadian-born, older, had a father with a trades certificate, or had participated in a Youth Apprenticeship Program (YAP) or a trade, vocational or technical program during high school were more likely than other female apprentices to choose to study in a male-dominated apprenticeship program. Among male apprentices, previous certification in a trade or having participated in a YAP or trade, vocational or technical program during high school was negatively associated with selecting a female-dominated program.

Women who studied in male-dominated apprenticeship programs generally had poorer labour market outcomes than their male counterparts. Among apprentices who selected male-dominated programs, women were as likely as men to receive sick leave benefits in their jobs but received lower median hourly wages than men did. Fewer gender differences were found among apprentices who selected female-dominated or mixed (neither male- nor female-dominated) programs. However, while the median wages of women who studied in female-dominated or

mixed apprenticeship programs did not differ significantly from those of their male counterparts, these women did earn less than men at the higher end of the wage distribution (75th percentile).

This study expands on previous research by providing more comprehensive information about the factors affecting female apprentices' choice of a male-dominated apprenticeship program and the labour market prospects of women who study these trades. The findings presented can increase women's awareness and knowledge of these trades and aid in their selection of an apprenticeship program. Policymakers can also use these findings to facilitate women's entry into male-dominated apprenticeship programs.

1 Introduction

Women's participation in the Canadian labour force has increased substantially over the last several decades (Morissette 2015). Although this increase has contributed to more women entering male-dominated occupations, women continue to account for a small proportion of workers in these jobs overall. Canadian women are still largely concentrated in historically female-dominated occupations, such as teaching, nursing and related health occupations, social work, and sales and service occupations (Moysier 2017).¹ Occupational segregation by sex is particularly pronounced among Canadians who do not hold a university degree (Uppal and LaRochelle-Côté 2014).

Increasing women's participation in the skilled trades has been identified as a means of creating a more diverse labour force, improving women's wages, and fully utilizing women's skills (Ericksen and Palladino Schultheiss 2009; Greene and Stitt-Gohdes 1997). Concerns have also been expressed about the supply of skilled tradespersons in an aging Canadian workforce (Carey 2014; Pyper 2008).² Greater interest from women in pursuing these occupations could help address these concerns. However, results from the 2015 National Apprenticeship Survey (NAS) indicate that only about 1 in 10 Canadian apprentices are women and that most of them are concentrated in female-dominated programs (Frank and Jovic 2017; Laryea and Medu 2010).³

Very little is known about the factors influencing the decision of female apprentices to pursue male-dominated programs.⁴ This study addresses that information gap with information available from the 2015 NAS. Previous research has suggested that pre-program information, such as highest level of education or whether an apprentice's parents held a trades certificate, can be particularly useful in examining this issue.

One factor that could play an important role in female apprentices' program selection is knowledge of the labour market outlook for women in male-dominated trades. This warrants a separate analysis, and that is the approach adopted in this study.

Most studies that have examined the labour market outcomes of apprentices have focused on comparing their earnings to those of graduates with different levels of education. Results from the 2016 Census showed that Canadian men who held apprenticeship certificates earned more than their peers whose highest level of education was a high school diploma or college diploma (Statistics Canada 2017a). However, the same was not true for women. Female apprentices earned about 12% less than women who held only a high school diploma.⁵ Previous studies found similar differences and attributed female apprentices' lower earnings to their selection of

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1. Sex-role stereotypes, family considerations and institutional barriers are often cited as the primary influences on women's occupational choices (Ericksen and Palladino Schultheiss 2009; Frome et al. 2006). A lack of awareness of training opportunities and the benefits of male-dominated occupations, particularly those in the trades, may also play a role (Greene and Stitt-Gohdes 1997; Lillydahl 1986).
 2. Whether Canada has a significant shortage of skilled labour has been debated. Criticism generally centres on the lack of an "objective indication of skills shortages" in determining a future skills shortage (Sharpe and Gibson 2005, p. 79; Massé, Roy and Gingras 1998).
 3. Despite their underrepresentation, female apprentices are neither more nor less likely to complete their apprenticeship program than men, although this may be attributable mainly to their concentration in shorter apprenticeship programs (Cadioux 2010; Laporte and Mueller 2011).
 4. Studies indicate that women working in the skilled trades tend to be more interested in work that is physical and autonomous and are more money-oriented than women who pursue female-dominated occupations (Lillydahl 1986; Walshok 1981). High school apprenticeship programs and having a parent in the trades have also been found to influence women's decision to enter male-dominated trades (Taylor, Hamm and Raykov 2015).
 5. Additional analyses were conducted with the Labour Force Survey to examine trends over time (1997–2016) among men and women aged 25 to 34. Results showed that median wages for men with an apprenticeship certificate improved substantially over the last 20 years. However, the median wages of women with an apprenticeship certificate have remained stable over time (results available upon request).

apprenticeship programs in lower-paying trades (Gunderson and Krashinsky 2012; Boothby and Drewes 2010).

To further explore how women's selection of apprenticeship programs factor into their labour market outcomes, Boothby and Drewes (2010) compared the earnings of women in male-dominated trades with those of their peers whose highest level of education was a high school diploma. The results showed that women who selected male-dominated trades earned about 27% more than women with a high school diploma. These results suggest that female apprentices who choose to study in a male-dominated apprenticeship program have more favourable labour market outcomes than those who study in female-dominated programs.

Although research shows notable wage differences between apprentices who studied in male-dominated and female-dominated programs, one question that has not been addressed is how well female apprentices fare in the labour market relative to their male counterparts who studied the same type of program. This study examines differences in the labour market outcomes of women and men who selected the same type of apprenticeship program, identified as male-dominated, mixed (neither male- nor female-dominated), or female-dominated. A wide range of outcomes are examined, including employment status, self-employment, obtaining a job related to the trade of study, hours worked per week, union membership, a series of job benefits, and hourly wages.

By providing a more detailed picture of women's labour market prospects after studying in male-dominated apprenticeship programs, women can obtain a clearer idea of what to expect from this type of career choice.

This study addresses the following questions:

1. What proportion of female apprentices select male-dominated apprenticeship programs and what proportion of male apprentices select female-dominated programs?
2. Among apprentices, what characteristics are associated with women selecting male-dominated programs and men selecting female-dominated programs?
3. What are the labour market outcomes of women who selected male-dominated apprenticeship programs relative to those of men who selected the same type of program?

This paper is organized as follows. Section 2 reviews the data and methodology. Results are discussed in Section 3. Section 4 concludes, providing an overview of the findings.

2 Data and methodology

Data from the 2015 National Apprenticeship Survey (NAS) were used in this study. The NAS is a cross-sectional survey that sampled registered apprentices in Canada who ended (i.e., completed or discontinued) their program in 2011, 2012 or 2013. The data were collected from September 2015 to March 2016 and linked to four years of tax data (2011 to 2014) from the T1 Family File (T1FF). The sample size is 28,359.⁶

The categorization of apprenticeship programs was based primarily on the 25 major trade groups used in the Registered Apprenticeship Information System (RAIS), an administrative database that collects information about registered apprentices from Canada's provinces and territories. Programs were first assessed using National Occupational Classification (NOC) codes (four-digit level) that were associated with each program. Programs that were classified in a male-dominated RAIS major group but were female-dominated or mixed (neither male- nor female-dominated) at the four-digit NOC level were removed from the major group and reclassified to either the female-dominated or mixed group of programs.⁷ The focus of this study was to examine women who were registered in male-dominated apprenticeship programs. However, comparisons between women and men in female-dominated apprenticeship programs and "mixed" programs (i.e., neither male- nor female-dominated) were also made. Overall, women accounted for 13.7% of the NAS sample.⁸

2.1 Analysis of women's selection of male-dominated apprenticeship programs

This study is divided into two analytical sections. The first section is a multivariate analysis in which women's selection of a male-dominated apprenticeship program (conditional on completing or discontinuing an apprenticeship program) is regressed on sociodemographic characteristics by ordinary least squares (OLS). These characteristics include:

- age at the time of registration in the apprenticeship program
- age squared
- highest certificate, diploma or degree completed prior to entering the apprenticeship program
- immigrant status
- father has a trades certificate
- mother has a trades certificate
- apprentice participated in a Youth Apprenticeship Program (YAP) or a trade, vocational or technical program in high school⁹
- province or territory of program of study.

6. This sample size is slightly smaller than the full 2015 NAS sample size of 28,469 due to some apprentices reporting that they ended their apprenticeship program in 2010. These individuals were consequently excluded from the analytical sample.

7. For example, men accounted for 56.1% of the "storekeepers and partspersons" group (NOC 1522), which is part of the (male-dominated) "automotive service technician" RAIS major group. In this case, apprentices in NOC group 1522 were assigned to the "mixed" group (see Appendix Table 1). Programs were not examined at a more detailed level within the study due to small sample sizes of women across several male-dominated programs.

8. RAIS administrative data confirm that women accounted for 13.7% of apprentices who completed or discontinued their apprenticeship programs in 2011, 2012 or 2013 (Statistics Canada's Table 37-10-0123-01 [Statistics Canada n.d.]).

9. A YAP enables high school students to gain experience in apprenticeship occupations (similar to a co-operative education placement) and, possibly, transfer that experience into apprenticeship program credits. In the NAS, all respondents except those from Quebec were asked whether they were registered in a YAP during high school. Respondents who were not registered in a YAP or were from Quebec were asked whether they had taken a trade, vocational or technical program in high school. The variable used in this study combines information from these two variables to determine whether apprentices had any exposure to an apprenticeship or vocationally oriented program during high school.

Year of registration fixed effects were also included in the model. A second OLS model was run for male apprentices. This model examined the relationships between the same set of characteristics and the likelihood of selecting a female-dominated apprenticeship program.¹⁰

For the selection models, all apprenticeship programs were included in the analysis and identified as either male- or female-dominated programs. A “male-dominated” apprenticeship program was defined as one in which men accounted for at least 75% of apprentices in the program.¹¹ Similarly, a “female-dominated” apprenticeship program was defined as one in which women accounted for at least 75% of apprentices in the program. Programs that met neither of these criteria were classified as “mixed” programs.¹² In these cases, programs were coded as zero for both the male-dominated and female-dominated indicator variables.¹³ A list of the apprenticeship programs included in the male-dominated, mixed, and female-dominated groups and the proportion of men and women represented in each are presented in Appendix Table 1.

2.2 Analysis of labour market outcomes

The second analytical section examines the labour market outcomes of women by type of apprenticeship program (male-dominated, mixed, or female-dominated).

Descriptive results (means) are presented for all labour outcomes by sex across the three apprenticeship program groups. Median hourly wages are also provided for the hourly wage outcome.¹⁴ For this part of the analysis, only those apprentices who had valid information about their employment status, age and program completion status were examined. These restrictions reduced the analytical samples by less than 1%.¹⁵ Differences that are discussed refer primarily to the descriptive findings. However, multivariate analyses were also conducted to examine the statistical significance of gender differences and to verify whether differences between men and women remained after accounting for other factors.¹⁶ Any notable changes in the findings resulting from the multivariate models are reported.

The first labour market outcome is a measure of whether apprentices were employed during the week prior to their NAS interview (i.e., the reference week). Specifically, apprentices were asked whether they had worked in a job or business during the reference week. The second outcome

10. Since the proportion of male apprentices in female-dominated trades was very small (0.5% of male apprentices), additional models were run to determine whether the linear probability model (OLS) was appropriate to use. The OLS results were verified by examining the marginal probabilities from logit and probit models. Differences in the coefficients for these models were small, and the conclusions drawn from the OLS models remained the same. One difference was found for the women’s selection models. Refer to footnote 26 for details.

11. This definition is similar to the U.S. Department of Labor’s definition of male-dominated occupations; i.e. those in which men represent at least 75% of workers (United States Department of Labor 2014).

12. Several programs with very small sample sizes were identified as “mixed” programs at the four-digit NOC level and grouped together as “other mixed programs” (Appendix Table 1).

13. Since male-dominated and female-dominated apprenticeship program variables are dummy variables, each program is coded as either 0 or 1.

14. Median hourly wages are provided in the descriptive results because they are more easily interpreted than median log hourly wages. However, the median regression results presented are based on log hourly wages, which is standard practice in wage models. Median hourly wage results are also available upon request, as are mean hourly wage regression results.

15. Note that sample sizes vary slightly depending on the sample size restrictions for each labour market outcome and the outcome itself.

16. For the employment, self-employment and holding a job related to the trade of study outcomes, three sequential OLS regression models were run: Model 1 included only the sex variable; Model 2 included sex, age at the time of survey (2015), age squared, completion status, program of study (RAIS major groups), pre-apprenticeship experience in trade of study (dummy variable), year of program completion or discontinuation, highest level of education at time of survey (2015), and year of registration fixed effects; Model 3 included all Model 2 variables and census division. For the remaining outcomes—hours worked, union membership, receipt of benefits and wages—an additional model was run that included a variable indicating whether apprentices held a job related to their trade.

measured is the likelihood of being self-employed. Only those apprentices who were employed during the reference week were examined for the self-employment measure.

For the remaining labour market outcomes, only paid employees were examined. These measures include:

- holding a job related to the trade of study (as reported by the apprentice)¹⁷
- hours worked per week
- union membership, measured as the payment of union dues in 2014 (determined from T1FF data)
- receipt of a series of benefits (i.e., extended health benefits, dental plan, retirement plan, paid vacation leave, sick leave and other benefits)
- median hourly wages.

Median regression models were used to compare the median log hourly wages of women and men who were apprentices in the same type of program. Wages were reported by NAS respondents according to the job they held the week prior to their NAS interview.¹⁸ Since the primary objective of this study is to examine how women fare relative to men who studied the same type of apprenticeship program, the coefficient of interest is that associated with the sex variable (measured with a “female” indicator variable). Therefore, to obtain a baseline for comparison, the only covariate included in Model 1 was sex. Model 2 accounted for:

- sex
- age at the time of survey (2015)
- age squared
- completion status (completed or discontinued program in 2011, 2012 or 2013)¹⁹
- pre-apprenticeship experience in trade of study
- program of study (RAIS major groups)
- year of completion or discontinuation
- highest level of education in 2015
- year of registration fixed effects.

Census division²⁰ fixed effects were added in Model 3 to account for variations in local labour market conditions, as well as jurisdictional differences (e.g., provincial minimum wage laws or other factors that may affect specific trades). Model 4 included a variable that indicates whether an apprentice’s job was related to his/her trade of study and Model 5 included a measure of union membership (in 2014). The variables introduced in Models 3, 4 and 5 were included in a step-wise manner to address their possibly endogenous relationship with the variables introduced in earlier models.²¹

17. This is a subjective measure that may cause respondents to consider factors other than just a direct occupational match, such as performing similar job tasks (Frank and Jovic 2017).

18. Since some respondents could more easily report their yearly, monthly or weekly salary, the hourly wage variable includes some values that were derived from additional information, including: number of months worked per year, number of weeks worked per month, number of days worked per week, whether respondents worked every week of the month, the number of weeks worked per month, and the average number of hours worked per week.

19. Since discontinuers represented 42.5% of the NAS sample, both completers and discontinuers were retained in the analytical sample. Therefore, regression analyses account for apprentices’ completion status.

20. A census division is an area of regional government (e.g., county, regional district) or an area treated as equivalent for statistical purposes. It usually comprises a number of adjacent census subdivisions (municipalities) (Statistics Canada 2017b).

21. Note that this study does not attempt to explain the contributing factors of the wage gap through decomposition methods because only a small number of possible explanatory factors are available in the NAS. Instead, the study estimates alternative measures of the wage gap according to different conditioning factors (some are exogenous while some, such as census division, may be endogenous). Generally, when explanatory variables were entered into the median regression models, the results did not change substantively.

The median regression coefficients and statistical significance for the female indicator variable for all models of the log hourly wage outcome are presented for each of the three types of apprenticeship programs. As a result of the large quantity of regression results produced, information for the other covariates is not presented in this paper but is available upon request.

Quantile regression results examining differences between women and men at different points in the wage distribution (25th and 75th percentiles) are also presented, accounting for all covariates listed above (Model 5).

3 Results

3.1 Male-dominated and female-dominated apprenticeship programs

The two analytical sections to follow (apprenticeship selection and labour market outcomes) rely on a classification of male- and female-dominated apprenticeships, which was described in the Data and methodology section.

Across the majority of male-dominated apprenticeship programs, men accounted for at least 90% of apprentices (Appendix Table 1).²² Among female-dominated programs, 94.1% of apprentices were women. Apprentices in chef and cook programs and user support technician programs had more equal representations of men and women (62.3% male and 53.4% female, respectively).

Overall, 20.7% of female apprentices selected male-dominated apprenticeship programs. By contrast, only 0.5% of male apprentices selected female-dominated programs. Nearly one in five women who selected a male-dominated apprenticeship program were in welder or other machining or metal forming programs (19.7%), while slightly lower proportions chose electrician (18.5%) or carpenter or cabinetmaker (17.3%) programs.²³ The majority of men in a female-dominated program were hairstylist or barber apprentices (84.6%).^{24,25}

3.2 Apprentices' selection of male-dominated or female-dominated programs

Table 1 shows results for the OLS regressions of women's selection of male-dominated apprenticeship programs and men's selection of female-dominated programs on sociodemographic characteristics.²⁶

The likelihood of female apprentices selecting a male-dominated program increased with age. Immigrant women were less likely than Canadian-born women to select a male-dominated apprenticeship program. Moreover, women who had less than a high school education were less likely than those with only a high school diploma to select a male-dominated apprenticeship program. Women in all provinces and territories were more likely to select a male-dominated apprenticeship program than women in Ontario. This may be because many women in Ontario

22. Note that some programs were grouped together due to small sample sizes.

23. Additionally, 8.2% of women in male-dominated programs were plumber/pipefitter/steamfitter apprentices and 6.7% were automotive service technician apprentices (excluding storekeepers and partspersons). The remainder studied "other" male-dominated programs.

24. The remaining male apprentices in female-dominated programs studied "other" female-dominated programs (grouped together due to small sample sizes).

25. The data shown in this paragraph are derived from the 2015 National Apprenticeship Survey.

26. The logit and probit models showed similar results to those of the OLS models in Table 1. One exception was that the logit model for women's selection of male-dominated apprenticeship programs indicated that female apprentices from Nunavut did not differ significantly from their Ontario counterparts in their likelihood of selecting a male-dominated apprenticeship program.

choose to study in early-childhood and assistants programs (female-dominated programs), which are not designated trades in other provinces and territories.

Parents' certification in a trade also mattered. Previous qualitative research on Canadian women working in male-dominated trades found that having a father working in a trade was often influential to a woman's decision to enter an apprenticeship program (Taylor, Hamm and Raykov 2015). Results from Table 1 support these findings, indicating that women whose father had a trades certificate were more likely to select male-dominated apprenticeship programs than those whose father did not have this training. However, mother's certification in a trade was negatively associated with women selecting a male-dominated trade. Although the data do not indicate the type of trades certificate held by each parent, women may be influenced by the male- or female-dominated nature of the certificate held by the father or mother.

Table 1
Results from ordinary least squares regression models predicting women's selection of male-dominated apprenticeship programs and men's selection of female-dominated apprenticeship programs

Variables	Women's selection of male-dominated apprenticeship program		Men's selection of female-dominated apprenticeship program	
	coefficient	standard error	coefficient	standard error
Age at registration	0.0371 ***	0.0060	0.0003	0.0004
Age squared	-0.0005 ***	0.0001	0.0000	0.0000
Highest certificate/degree completed pre-apprenticeship (high school diploma=reference group)				
Less than high school	-0.121 **	0.045	0.000	0.001
Trades certificate or diploma	-0.015	0.051	-0.002 *	0.001
College / CEGEP / other non-university	0.020	0.025	0.001	0.002
University certificate/degree	0.052	0.033	0.005	0.007
Immigrant status	-0.128 ***	0.024	0.009 **	0.003
Father has trades certificate	0.077 **	0.024	-0.001	0.001
Mother has trades certificate	-0.078 **	0.029	0.000	0.001
Took Youth Apprenticeship Program or trade/vocational/technical program in high school	0.044 *	0.021	-0.003 *	0.001
Province/territory of registration (Ontario=reference group)				
Newfoundland and Labrador	0.362 ***	0.033	-0.003	0.002
Prince Edward Island	0.237 ***	0.059	-0.006 ***	0.002
Nova Scotia	0.354 ***	0.041	-0.006 **	0.002
New Brunswick	0.519 ***	0.044	-0.006 **	0.002
Quebec	0.328 ***	0.051	-0.005	0.003
Manitoba	0.067 ***	0.018	-0.004 †	0.002
Saskatchewan	0.143 ***	0.023	-0.001	0.003
Alberta	0.334 ***	0.027	-0.004	0.002
British Columbia	0.328 ***	0.037	-0.007 **	0.002
Northwest Territories	0.480 ***	0.064	-0.007 **	0.002
Yukon	0.472 ***	0.109	-0.006 **	0.002
Nunavut	0.609 **	0.216	-0.007 *	0.003

* significantly different from reference category (p < 0.05)

** significantly different from reference category (p < 0.01)

*** significantly different from reference category (p < 0.001)

† significantly different from reference category (p < 0.10)

Note: Sample: Apprentices in selected apprenticeship programs who completed or discontinued their program in 2011, 2012 or 2013. Year of registration fixed effect is included in both models. Sample size is 3,354 in women's selection of male-dominated apprenticeship program and 24,257 in men's selection of female-dominated apprenticeship program.

Source: Statistics Canada, 2015 National Apprenticeship Survey.

Among male apprentices, previous certification in a trade or participating in a YAP or a trade, vocational or technical program in high school both had negative relationships with selecting a female-dominated apprenticeship program (Table 1). Results also indicated that immigrant men were more likely than Canadian-born men to select a female-dominated apprenticeship program.²⁷

3.3 Labour market outcomes of women in male-dominated apprenticeship programs

Descriptive results on labour market outcomes appear in Table 2. Additional regression analyses were run to test the statistical significance of differences between men and women in the same type of apprenticeship program.²⁸ All differences that are discussed within the text are statistically significant at the 10% level ($p < 0.10$) unless otherwise indicated.

Women were less likely to be employed than men across all three types of apprenticeship programs studied. Among employed apprentices, women who studied male-dominated or female-dominated programs were less likely to be self-employed than men who selected the same type of program. However, there was no statistically significant difference in the likelihood of being self-employed between men and women who were apprentices in mixed programs.

A labour market outcome that is of particular interest to postsecondary students is obtaining employment that is related to their program of study. Women who were apprentices in male-dominated or female-dominated programs were substantially less likely than their male counterparts to report holding a job that was related to their trade of study. Among apprentices in mixed programs, women were as likely as men to hold a job that was related to their trade of study.

Overall, female apprentices worked fewer hours per week than men who studied the same type of apprenticeship program. The largest difference was between men and women who were apprentices in female-dominated trades, where women worked about 6.5 fewer hours than men on average. In comparison, women worked 3.8 fewer hours than their male counterparts in male-dominated programs.

Across the three different types of apprenticeship programs, few gender differences in union membership were observed. There were no statistically significant differences between men and women who were apprentices in mixed or female-dominated programs. Moreover, while women who studied male-dominated apprenticeship programs were less likely than their male counterparts to be union members, this difference ceased to be statistically significant when differences in location (census division) were accounted for.

Another important labour market outcome is holding a job with benefits. The 2015 NAS collected information on six different types of benefits: extended health, dental plan, retirement plan, paid vacation leave, sick leave, and “other” benefits. Gender differences in the receipt of benefits by type of apprenticeship program are presented in Table 2.

Notably, there were no statistically significant gender differences in the receipt of sick leave benefits across all three types of apprenticeship programs. Overall, the fewest differences in benefits were between women and men who studied female-dominated or mixed apprenticeship programs. Women who studied female-dominated programs were significantly less likely than their male counterparts to receive paid vacation leave, while women in mixed programs were less likely than

27. Additional analysis at the four-digit NOC level showed that all immigrant men in female-dominated apprenticeship programs were registered in hairstylist/barber programs, while Canadian-born men were dispersed across different programs.

28. See footnote 16 for detailed information about these models. These results are not presented in the paper, but are available upon request.

their male peers to receive dental benefits.²⁹ Conversely, women who studied male-dominated apprenticeship programs were less likely than their male counterparts to receive 5 of the 6 types of benefits.³⁰ However, when sociodemographic characteristics and census division were accounted for, there was no longer a statistically significant gender difference in the receipt of “other” benefits.

Table 2
Mean labour market outcomes and median log hourly wages by sex and apprenticeship program

Labour market outcomes and sex	Type of apprenticeship program		
	Male-dominated program	Mixed program	Female-dominated program
	mean		
Employed			
Men	0.87	0.91	0.92
Women	0.75	0.79	0.81
Self-employed			
Men	0.11	0.04	0.29
Women	0.08	0.06	0.19
Job related to trade			
Men	0.71	0.56	0.72
Women	0.56	0.56	0.61
Hours per week			
Men	46.42	43.49	42.24
Women	42.59	37.52	35.75
Union membership			
Men	0.43	0.19	0.14
Women	0.35	0.21	0.17
Has extended health benefits			
Men	0.70	0.61	0.29
Women	0.60	0.55	0.33
Has dental benefits			
Men	0.68	0.62	0.24
Women	0.56	0.52	0.32
Has retirement plan benefits			
Men	0.56	0.39	0.15
Women	0.42	0.43	0.22
Has paid vacation leave benefits			
Men	0.70	0.72	0.54
Women	0.53	0.68	0.51
Has sick leave benefits			
Men	0.44	0.48	0.22
Women	0.40	0.50	0.25
Has other benefits			
Men	0.24	0.25	0.07
Women	0.20	0.22	0.12
	median		
Hourly wages			
Men	33.94	20.69	20.57
Women	28.03	18.66	18.43

Note: Sample: Apprentices who completed or discontinued their program in 2011, 2012 or 2013, worked as paid employees during the reference week, and had valid information for hourly wages, age, completion status and year of completion.

Source: Statistics Canada, 2015 National Apprenticeship Survey.

29. When sociodemographic characteristics were included in Model 2, women who studied mixed programs were also significantly less likely to receive extended health benefits than their male counterparts.

30. The one exception was the receipt of sick leave benefits.

The last labour market outcome examined was median hourly wages. The descriptive results show that women generally had lower median wages than men who studied the same type of apprenticeship program. The median wage difference was largest between women and men who selected male-dominated apprenticeship programs.

Wage differences are explored further in the hourly wage median regression models. Descriptive information on the main covariates used for these models (mean age, proportion who completed their apprenticeship program, and proportion who completed/discontinued by year) are reported in Appendix Table 2. These results show that female apprentices were slightly older than their male counterparts in male-dominated and mixed programs and slightly younger in female-dominated programs.

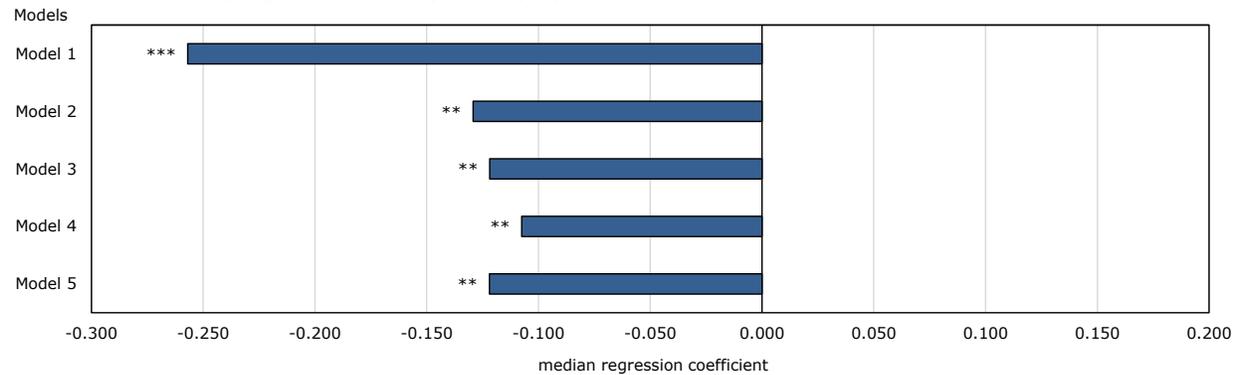
Multivariate results for median log hourly wages are presented by apprenticeship program in Charts 1 to 3.³¹ To obtain more information about potential gender differences at different points in the wage distribution, Charts 4 to 6 provide quantile regression results at the 25th, 50th and 75th percentiles. Since the focus of this paper is the labour market prospects of female apprentices, each chart shows the regression coefficients for the sex variable (female=1, male=0) for each of the regression models.

Female apprentices who studied male-dominated programs earned less than their male counterparts (Chart 1). Although wage differences between women and men were reduced when age, completion status, level of education in 2015, and year of registration were included in the regression model, the wage differences remained statistically significant across all models (Chart 1, Model 5). The gender difference in median log hourly wages in Models 2 to 5 were generally about 0.11 to 0.13, corresponding to roughly 12% to 14%.³² Overall, median wage differences were not statistically significant between women and men in mixed apprenticeship programs or female-dominated apprenticeship programs (Chart 2 and Chart 3, respectively).

31. OLS regressions were also conducted. These results indicated that the mean hourly wages of women in male-dominated and mixed programs were significantly less than their male counterparts. Among apprentices in female-dominated programs, average wages were similar for men and women in Models 1 and 2, but a significant difference was found when census division, holding a job related to the trade of study, and union membership were accounted for ($p < 0.10$).

32. This is determined from the following formula: $\text{percent effect} = (e^{\text{coefficient}} - 1) * 100$.

Chart 1
Median regression coefficients (female=1) for log hourly wages of women relative to men, for apprentices in male-dominated programs who are paid employees, 2015



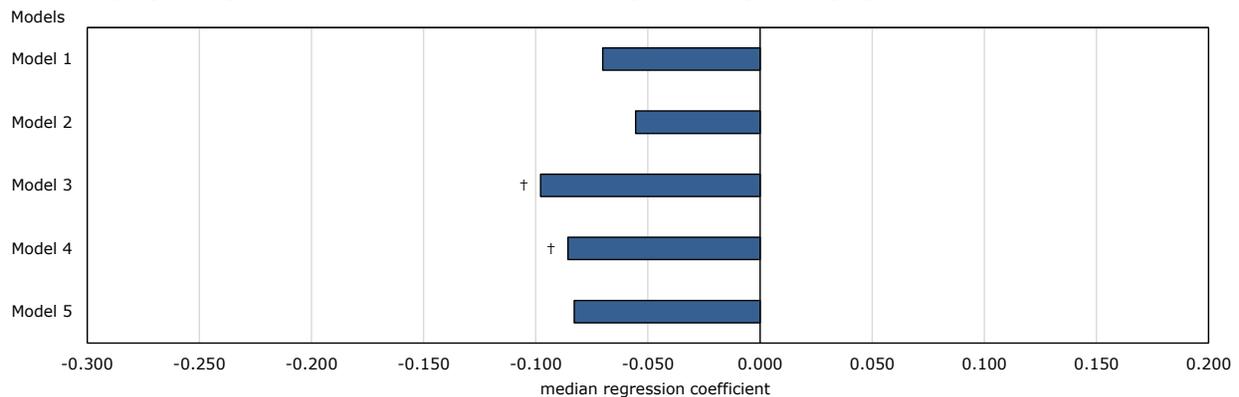
** significantly different from reference category ($p < 0.01$)

*** significantly different from reference category ($p < 0.001$)

Notes: Model 1: sex (female=1); Model 2: Model 1 variable plus age, age squared, completion status, year of completion, pre-apprenticeship experience in trade of study, program of study (major groups from the Registered Apprenticeship Information System), highest level of education (2015), year of registration; Model 3: Model 2 variables plus census division; Model 4: Model 3 variables plus variable on job related to trade; Model 5: Model 4 variables plus union membership in 2014. Sample: Apprentices who completed or discontinued their apprenticeship in 2011, 2012 or 2013, worked as paid employees during the reference week, and had valid information for hourly wages, age, completion status, and year of completion.

Source: Statistics Canada, 2015 National Apprenticeship Survey.

Chart 2
Median regression coefficients (female=1) for log hourly wages of women relative to men, for apprentices in mixed programs (neither male- nor female-dominated) who are paid employees, 2015

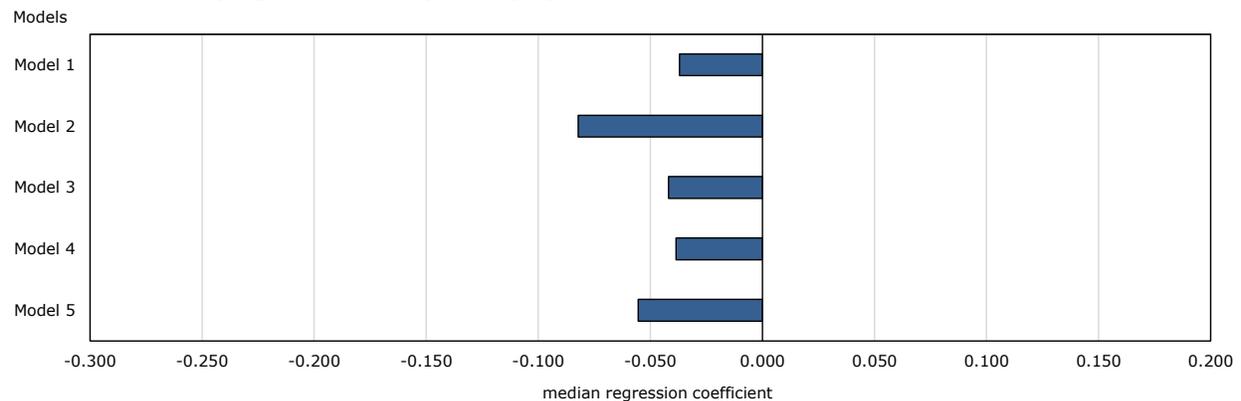


† significantly different from reference category ($p < 0.10$)

Notes: Model 1: sex (female=1); Model 2: Model 1 variable plus age, age squared, completion status, year of completion, pre-apprenticeship experience in trade of study, program of study (major groups from the Registered Apprenticeship Information System), highest level of education (2015), year of registration; Model 3: Model 2 variables plus census division; Model 4: Model 3 variables plus variable on job related to trade; Model 5: Model 4 variables plus union membership in 2014. Sample: Apprentices who completed or discontinued their apprenticeship in 2011, 2012 or 2013, worked as paid employees during the reference week, and had valid information for hourly wages, age, completion status, and year of completion.

Source: Statistics Canada, 2015 National Apprenticeship Survey.

Chart 3
Median regression coefficients (female=1) for log hourly wages of women relative to men, for apprentices in female-dominated programs who are paid employees, 2015



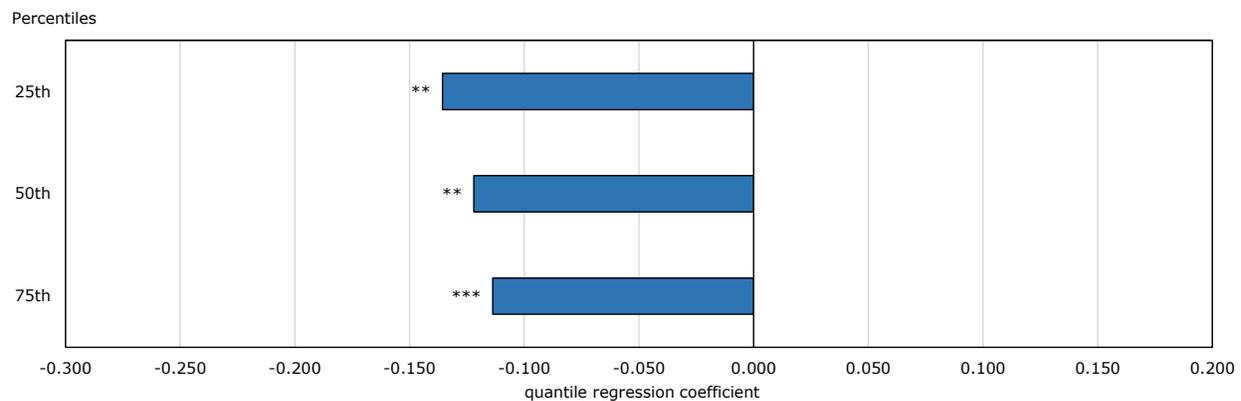
Notes: Model 1: sex (female=1); Model 2: Model 1 variable plus age, age squared, completion status, year of completion, pre-apprenticeship experience in trade of study, program of study (major groups from the Registered Apprenticeship Information System), highest level of education (2015), year of registration; Model 3: Model 2 variables plus census division; Model 4: Model 3 variables plus variable on job related to trade; Model 5: Model 4 variables plus union membership in 2014. Sample: Apprentices who completed or discontinued their apprenticeship in 2011, 2012 or 2013, worked as paid employees during the reference week, and had valid information for hourly wages, age, completion status, and year of completion. Coefficients are not statistically significant.

Source: Statistics Canada, 2015 National Apprenticeship Survey.

Little is known about gender differences among apprentices at different points in the wage distribution. Among apprentices who studied male-dominated programs, women’s wages were significantly lower than men’s wages at all three points of the distribution examined (Chart 4).

Women who studied in mixed apprenticeship programs did not differ significantly from men who selected the same program in the 25th or 50th percentiles of the wage distribution (Chart 5). However, their wages were significantly lower than their male counterparts at the higher end of the distribution (75th percentile; $p < 0.10$). Similar results were found among apprentices who studied female-dominated programs, where women earned less than men at the 75th percentile ($p < 0.10$).

Chart 4
Quantile regression coefficients (female=1) for the 25th, 50th, and 75th percentiles of log hourly wages of women relative to men, for apprentices in male-dominated programs who are paid employees, 2015



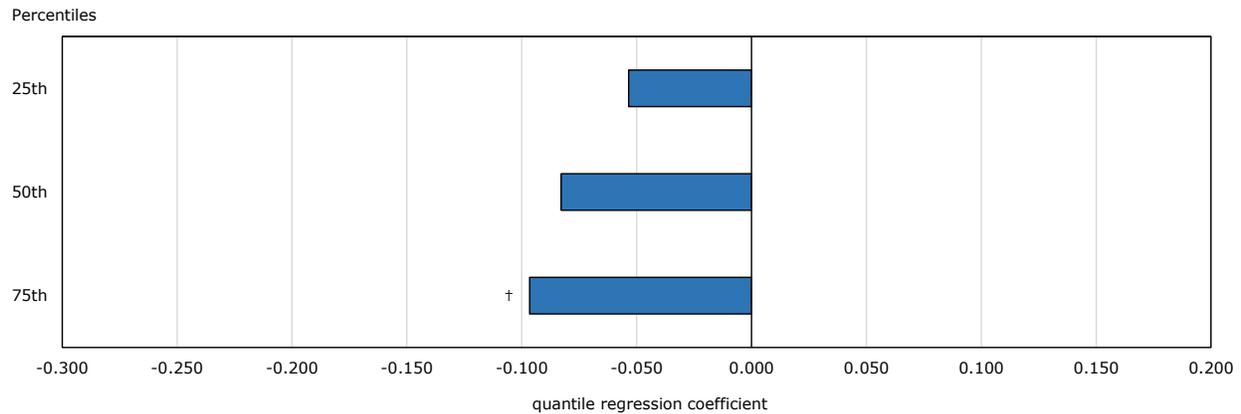
** significantly different from reference category ($p < 0.01$)

*** significantly different from reference category ($p < 0.001$)

Notes: Model: sex (female=1), age, age squared, completion status, year of completion, pre-apprenticeship experience in trade of study, program of study (major groups from the Registered Apprenticeship Information System), highest level of education (2015), year of registration, census division, variable on job related to trade, union membership in 2014. Sample: Apprentices who completed or discontinued their apprenticeship in 2011, 2012 or 2013, worked as paid employees during the reference week, and had valid information for hourly wages, age, completion status, and year of completion.

Source: Statistics Canada, 2015 National Apprenticeship Survey.

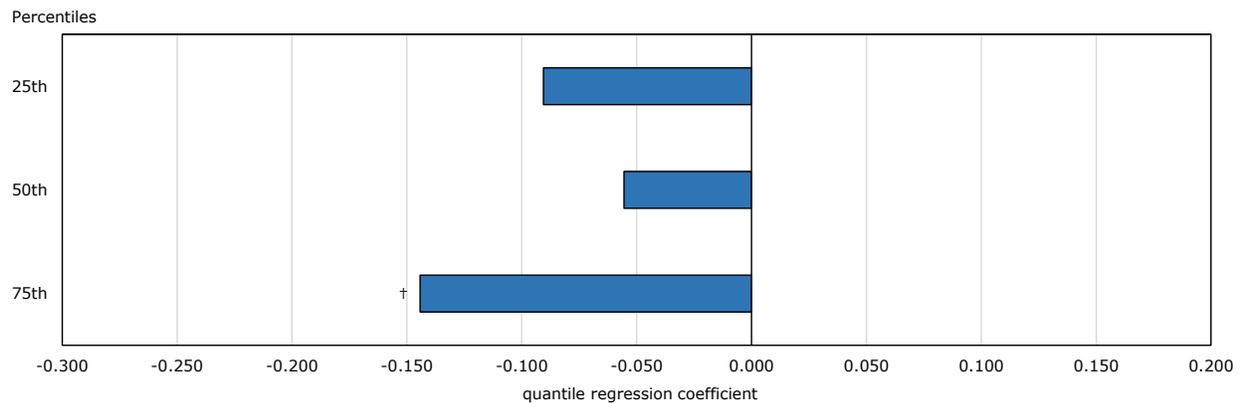
Chart 5
Quantile regression coefficients (female=1) for the 25th, 50th, and 75th percentiles of log hourly wages of women relative to men, for apprentices in mixed programs who are paid employees, 2015



† significantly different from reference category ($p < 0.10$)

Notes: Model: sex (female=1), age, age squared, completion status, year of completion, pre-apprenticeship experience in trade of study, program of study (major groups from the Registered Apprenticeship Information System), highest level of education (2015), year of registration, census division, variable on job related to trade, union membership in 2014. Sample: Apprentices who completed or discontinued their apprenticeship in 2011, 2012 or 2013, worked as paid employees during the reference week, and had valid information for hourly wages, age, completion status, and year of completion.
Source: Statistics Canada, 2015 National Apprenticeship Survey.

Chart 6
Quantile regression coefficients (female=1) for 25th, 50th, and 75th percentiles of log hourly wages of women relative to men, for apprentices in female-dominated programs who are paid employees, 2015



† significantly different from reference category ($p < 0.10$)

Notes: Model: sex (female=1), age, age squared, completion status, year of completion, pre-apprenticeship experience in trade of study, program of study (major groups from the Registered Apprenticeship Information System), highest level of education (2015), year of registration, census division, variable on job related to trade, union membership in 2014. Sample: Apprentices who completed or discontinued their apprenticeship in 2011, 2012 or 2013, worked as paid employees during the reference week, and had valid information for hourly wages, age, completion status, and year of completion.
Source: Statistics Canada, 2015 National Apprenticeship Survey.

4 Conclusion

Increasing women's participation in male-dominated trades has been identified as a means of improving the supply of skilled tradespersons in Canada, creating a more diverse workforce, and increasing women's wages. Previous studies suggest that women working in male-dominated trades have higher earnings than women in female-dominated trades (Boothby and Drewes 2010). However, little information exists about women's decision to enter male-dominated apprenticeship programs and their labour market outcomes. This study examined two previously understudied dimensions of women in male-dominated apprenticeship programs: factors associated with their decision and their labour market prospects.

About one in five female apprentices selected a male-dominated apprenticeship program. Several sociodemographic factors were associated with women's program choice. Women who were Canadian-born, older, had a father with a trades certificate, or participated in a YAP or a trade, vocational or technical program during high school were more likely to choose a male-dominated apprenticeship program. In addition, having a mother with a trades certificate was negatively associated with female apprentices selecting a male-dominated program. The influence of a parent's certification in a trade may be linked to the male- or female-dominated nature of the certificate held by the father or mother. Among male apprentices, previous certification in a trade or having participated in a YAP or a trade, vocational or technical program during high school was associated with a lower likelihood of selecting a female-dominated program.

Women who studied male-dominated apprenticeship programs generally had poorer labour market outcomes than their male counterparts. Women who selected these programs were less likely to be employed than their male peers, hold a job related to their trade of study, or receive 5 of the 6 types of benefits that were examined. However, female apprentices who studied male-dominated programs were as likely as their male counterparts to receive sick leave benefits in their jobs. Additionally, when sociodemographic and census division variables were accounted for, women who studied male-dominated programs were as likely as men to be union members.

Women who selected mixed or female-dominated apprenticeship programs experienced fewer disadvantages across labour market outcomes compared to men who selected the same types of programs. For example, women who selected mixed programs were as likely as their male counterparts to work in a job related to their trade, be union members, and receive paid vacation leave and retirement plan benefits in their jobs. Although women who selected female-dominated programs were less likely than their male counterparts to be employed or hold a job related to their trade of study, they were as likely to be union members and receive extended health, dental plan, retirement plan, and sick leave benefits.

Female apprentices who studied male-dominated apprenticeship programs received lower median hourly wages than their male counterparts. Gender differences were also observed at the lower and upper ends of the wage distribution for apprentices in male-dominated programs. Although the median wages of female apprentices who studied in mixed or female-dominated programs did not differ significantly from those of their male peers, female apprentices did earn less than their male counterparts at the higher end of the wage distribution (75th percentile).

Several factors that contribute to gender gaps in labour outcomes could not be accounted for with the data used in this study. For example, previous studies have identified job tenure, accumulated work experience, performance-based pay, firm size, overtime pay, foreign ownership, work schedules, the division of labour within households, and discrimination as factors associated with the gender wage gap (Blau and Kahn 2007; Drolet 2002; O'Neill 2003). Therefore, conclusions made from the results of this study should keep this limitation in mind.

The findings presented in this study can help to increase women's awareness and knowledge of careers in male-dominated trades. School and career counsellors may also find this information useful for guiding girls and women whose interests and abilities align with occupations in male-dominated trades. Furthermore, results from this study can be used by policymakers to inform strategies for increasing women's participation in male-dominated apprenticeship programs.

Appendix Tables

Appendix Table 1

List of male-dominated, mixed (neither male- nor female-dominated), and female-dominated apprenticeship programs, based on NOC occupational groups

	Proportion of apprentices
	percent
Male-dominated programs (percentage of men)	96.6
Agricultural service contractors, farm supervisors and specialized livestock workers	88.5
Aircraft mechanics and aircraft inspectors	94.4
Automotive service technicians, truck and bus mechanics, and mechanical repairers	98.1
Boilermakers	99.8
Bricklayers	96.1
Cabinetmakers	87.9
Carpenters	97.1
Concrete finishers	100.0
Construction millwrights and industrial mechanics	98.3
Construction trades helpers and labourers	90.0
Crane operators	99.9
Electrical power and telecommunications line and cable workers	98.0
Electricians (except industrial and power system)	96.0
Elevator constructors and mechanics	94.6
Floor covering installers	85.3
Gas fitters	98.6
Glaziers	100.0
Heavy equipment operators (except crane)	96.8
Heavy-duty equipment mechanics	99.0
Industrial electricians	97.9
Industrial instrument technicians and mechanics	98.4
Insulators	83.9
Ironworkers	97.1
Landscape and horticulture technicians and specialists	88.6
Machining tool operators	93.4
Machinists and machining and tooling inspectors	93.8
Motor vehicle body repairers	98.1
Motorcycle, all-terrain vehicle and other related mechanics	100.0
Oil and gas well drillers, servicers, testers and related workers	100.0
Oil and solid fuel heating mechanics	99.2
Other small engine and small equipment repairers and other automotive mechanical installers and servicers	95.0
Other trades and related occupations, not elsewhere classified	100.0
Painters and decorators (except interior decorators)	89.6
Plasterers, drywall installers and finishers, and lathers	95.6
Plumbers	97.2
Power engineers and power systems operators	100.0
Power system electricians	100.0
Refrigeration and air conditioning mechanics	97.0
Roofers and shinglers	100.0
Sheet metal workers	98.1
Steamfitters, pipefitters and sprinkler system installers	97.8
Structural metal and platework fabricators and fitters	99.4
Tiles setters	100.0
Tool and die makers	100.0
Transport truck drivers	94.3
Water and waste treatment plant operators	85.8
Welders and related machine operators	93.3
Other male-dominated programs	95.6

Notes: The National Occupational Classification (NOC) occupational groups presented are at the unit group (four-digit) level; some NOC groups were aggregated into "other" groups because of small sample sizes. Sample: Apprentices who completed or discontinued their program in 2011, 2012, or 2013.

Source: Statistics Canada, 2015 National Apprenticeship Survey.

Appendix Table 1

List of male-dominated, mixed (neither male- nor female-dominated), and female-dominated apprenticeship programs, based on NOC occupational groups (continued)

	Proportion of apprentices
	percent
Mixed programs (percentage of men)	54.6
Bakers	56.1
Chefs and cooks	62.3
User support technicians	46.6
Other mixed programs	49.5
Female-dominated programs (percentage of women)	94.1
Estheticians, electrologists and related occupations	100.0
Hairstylists and barbers	93.1
Other female-dominated programs	96.4

Notes: The National Occupational Classification (NOC) occupational groups presented are at the unit group (four-digit) level; some NOC groups were aggregated into "other" groups because of small sample sizes. Sample: Apprentices who completed or discontinued their program in 2011, 2012, or 2013.

Source: Statistics Canada, 2015 National Apprenticeship Survey.

Appendix Table 2

Descriptive information for key covariates in log hourly wage regression sample

Type of program	Age		Completed apprenticeship		Year apprentice completed or discontinued program					
	Men	Women	Men	Women	Men			Women		
					2011	2012	2013	2011	2012	2013
	mean									
Male-dominated program	33.5	34.3	0.58	0.44	0.33	0.31	0.36	0.30	0.34	0.36
Mixed program	32.5	35.1	0.49	0.51	0.25	0.33	0.42	0.22	0.32	0.46
Female-dominated program	31.7	29.3	0.53	0.64	0.30	0.29	0.41	0.30	0.34	0.36

Note: Sample: Apprentices who completed or discontinued their apprenticeship in 2011, 2012 or 2013, worked as paid employees during the reference week, and had valid information for hourly wages, age, completion status, and year of completion.

Source: Statistics Canada, 2015 National Apprenticeship Survey.

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