

**The earnings and employment outcomes for male and female postsecondary graduates of
coop and non coop programs**

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The changing needs of employers in the new economy have had a profound effect on the transition from school to work for all recent postsecondary graduates. Cooperative education programs address these needs by providing students with the opportunity to alternate between cycles of academic study and workforce participation, where the work performed by coop students is directly related to their field or program of study. Still little research is available to evaluate how successful coop programs are in terms of improving the labor market prospects of recent graduates in the new economy. Drawing on findings from the 2000 National Graduates Survey, this paper compares the earnings and employment outcomes of postsecondary graduates of coop and non-coop programs. The results reveal that graduates of coop programs report stronger earnings and employment outcomes than graduates of non-coop programs; however, the labor market payoff varies considerably by gender and field of study. The social and policy implications relating to these findings are discussed.

Key words: knowledge based economy, school to work transitions, postsecondary education, cooperative education.

Introduction

The changing needs of employers in the new economy have had a profound effect on the transition from school to work for all recent postsecondary graduates. While having a postsecondary credential is increasingly important for acquiring decent well-paying jobs, it no longer guarantees a good job in the labour market for youth in the evolving knowledge based economy (see Berg, 1970; Collins, 1979; Livingstone, 1998; Walters, 2004). In addition to a postsecondary education, job candidates are increasingly expected to have practical job-related training in the new economy, even for entry level positions. Thus, without practical on-the-job training, postsecondary graduates may experience difficulty making successful school-to-work transitions (Stromsdorfer, 1997)

Cooperative education programs may address this paradox by providing students with the opportunity to alternate between cycles of academic study and workforce participation, where the work performed by coop students is directly related to their field or program of study. By definition, cooperative programs alternate between periods of paid work and study (see Coll and Eames, 2004). Coop programs are generally longer than one year in length, and the work experience portion generally makes up between 30 and 50 percent of the program. These programs are different from internships, which are much shorter in duration, with the work portion typically performed over a few weeks or months, often during the summer.

The increasing popularity of coop programs is likely attributable to the benefits they provide by bringing students and higher education sectors together with governments, the private sector, and non-profit sectors (Coll and Eames, 2004). For example, businesses are able to benefit from coop programs through establishment of direct partnerships with higher education sectors. They are also able to obtain direct access to on-the-job training resources for specific skills involving advanced forms of knowledge and technology. In addition to preparing students for their eventual roles in the workforce by providing access to on-the-job training while still in the education system, coop programs also provide opportunities for students to develop contacts

in the workforce, build networks, and develop self confidence. Additional information on the non-economic benefits provided by cooperative programs can be found in Coll and Eames (2004).

Unfortunately, there is very little population based research available to evaluate the economic benefits of cooperative programs, particularly relating to the labour market outcomes of youth who have recently made their school-to-work transitions. The few noteworthy studies that could be identified are based on data collected in the 1980's and 90's. One study drawing on data from earlier versions of Statistics Canada's National Graduates Surveys has found that university graduates of cooperative programs are less likely to be overqualified than graduates of conventional programs (Frenette, 2004). However, the results of this study are slightly dated; they are based on a pool of graduates from 82, 86 and 1990 cohorts. Other research employing data from the 1995 National Graduates Survey also found that a coop program led to a significant improvement in yearly earnings two years after graduation among university graduates who obtained their degrees in 1995 (see Walters, 2003). Unfortunately, coop/non-coop findings of this study were not thoroughly discussed because the coop/non-coop distinction was used as control variable for a broader statistical analysis comparing the labour market outcomes of graduates of various fields of study.

Drawing on data from a large scale nationally representative survey, this paper will compare the earnings and employment outcomes of postsecondary graduates with conventional (non coop) postsecondary credentials with graduates of coop programs. Since past research has demonstrated that labour market outcomes and opportunities vary considerably by gender (Walters, 2006), comparisons will also be made for males and females. Statistical controls are used to ensure that the labour market differences identified in this study are attributable to the actual value of the credential (e.g., coop versus non coop programs) rather than the characteristics of graduates who select these credentials.

Methods

Data

The data used for this study are drawn from Statistics Canada's 2000 National Graduate Survey (NGS). The NGS is the largest and most comprehensive survey available in Canada to examine the school-to-work transitions of recent postsecondary graduates. The survey contains detailed school-to-work transition information on more than 30,000 postsecondary graduates of trades, college and university graduates from all provinces and territories. The survey population includes graduates of Canadian postsecondary institutions who completed their requirements for their degrees, diplomas, or certificates during the 2000 calendar year. Excluded from the survey are graduates of postsecondary institutions that do not adhere to the curriculum followed by publicly funded institutions. The NGS also excludes individuals who enrolled in part-time trade courses while employed full time, and people who completed vocational programs lasting less than three months.

Procedures and Variables

The first set of statistical models employ logistic regression to identify whether there are differences in employment status between graduates of coop programs and graduates of non-coop programs.¹ The response variable for these models identifies whether the respondent is employed full-time. The second set of regression models compare the earnings graduates of coop and traditional postsecondary programs. These models are restricted to full-time workers who are employed full-year and report positive earnings.

In comparing the earnings of graduates of coop and non-coop programs, a gamma generalized linear model (Nelder and Wedderburn, 1972) is employed, where the response

¹ Logistic regression is the most common generalized linear model, where the binomial distribution is used in the likelihood function and the logit link, $\log \frac{\pi}{1-\pi}$, is used to map the mean of the response variable to a set of linear predictors (see McCullagh and Nelder, 1989). Thus, the resulting linear equation is $\log \frac{\pi}{1-\pi} = \beta_0 + \beta_1 X_1 + \dots + \beta_k X_k$, where $\beta_0 \dots \beta_k$ represent the regression parameters, the X 's are the explanatory variables, and π in this analysis is the probability of being employed full-time.

variable is an estimate of gross annual earnings for the reference week job that was derived from the respondents' reported salary, how it was paid and the usual number of hours worked. The gamma generalized linear model is appropriate for a response variable with non-negative values and a positively skewed distribution (see McCullagh and Nelder, 1989). The generalized linear model framework is advantageous, in comparison to transforming the dependent variable in a linear model, because the link function can be separated from the conditional distribution of the response variable (Fox 2002).²

The key independent variable in this study distinguishes among various postsecondary graduates of coop and non-coop programs, and is grouped into the following categories:

1. Trades
2. College (coop)
3. College (non-coop)
4. University (coop)
5. University (non-coop)

Two other variables relating to education are included in this study as control variables. The first variable distinguishes between respondents who received and did not receive scholarship funding for their postsecondary program. The second variable is field of study and is based on the Classification of Instructional Programs (CIP) field of study classification system developed by the National Center for Education Statistics in the United States. The field of study categories for this variable are:

1. Education;
2. Arts, humanities and related fields;
3. Social sciences and related fields;
4. Commerce, management and business administration;
5. Mathematics and physical and biological sciences;
6. Engineering;

² The regression equation for the generalized linear model is conveniently expressed in matrix form as $g(\mu) = \eta = X\beta$, where $g(\mu) = \eta$ is the invertible link function connecting the linear predictor, $\eta = X\beta$, to the mean of the response variable y . The log link, $g(\mu) = \log_e \mu$, is used to relate the mean, μ , to expectation of the response variable. The right hand side of the equation consists of β , a vector of coefficients, and X , the design or model matrix of predictors that includes categorical, quantitative and polynomial regressors.

7. Health-related fields;
 8. Other (including not specified and undeclared)
- Finally, the regression analyses also employ the usual statistical controls for

sociodemographic characteristics including marital status, language of interview (English or French), visible minority status, mother's and father's education, region of interview, and age. Additional details including descriptive statistics regarding the variables in this study are provided in Table 1.

Descriptive Results

Contrasts on the variables included in this study between college and university graduates of traditional (non-coop) programs with their counterparts of coop programs are provided in Table 1.³

[Insert Table 1 Here]

The next section will identify the extent to which these differences in employment outcomes can be explained by the other variables in the analysis.

Regression Results

Employment Status

For the first set of regression models, logistic regression is used to model the probability of being employed full-time as a function of individual characteristics. The dependent variable is the respondents' full-time employment status at the time of the survey. The results for these models are provided in Table 2. The estimates, standard errors, and corresponding tests of statistical significance for the regression of full-time employment status on the postsecondary program variable are provided in Model 1. These estimates represent the log-odds of being employed full-time relative to not being employed full-time.⁴ They are converted into predicted probabilities (accompanied by corresponding 95% confidence intervals) in Figure 1 to provide meaningful

³ The estimates in Table 1 exclude graduates of trades programs so that direct comparisons of coop and non-coop programs can be made at the college and university levels. Contrasts between graduates of coop and non-coop programs for *all* postsecondary graduates (including Trades graduates) in this study are provided in Appendix A.

⁴ Indicator (0-1 dummy) coding is used to provide contrasts for the categorical variables.

comparisons across the groups.⁵ The fitted values displayed in this figure reveal a markedly wide range in predicted probabilities of full-time employment across the five groups of postsecondary graduates. It is also clear from the graph that college and especially university graduates improve their probability being employed full-time in 2002 if they completed a coop program in 2000. Both university and college graduates of traditional (non-coop) programs are less likely to be employed full-time two years after graduation than graduates of trades programs.

[Insert Table 2 Here]

[Insert Figure 1 Here]

In Model 2 the variables for sex and the interaction between sex and postsecondary program are added to determine whether the findings from Model 1 similarly apply to males and females. The effects of postsecondary program and sex are both statistically significant, as is the interaction between the two variables ($p < .001$).^{6 7} The estimates provided in Figure 2 are derived from the parameter estimates in Model 2; they represent the probability of being employed full-time for graduates of each postsecondary program, separately for males and females. The graph reveals large differences in full-time employment status for males and females, particularly among trades and college graduates. Trades programs provide particularly favourable full-time employment opportunities for males but not females. For example, the probability of being employed full-time for male trades graduates is 97 percent, in comparison with 85 percent for females. Coop programs significantly improve the employment prospects of all college and university graduates, except for female community college graduates. However, coop programs provide a particularly strong improvement in the probability of being employed full-time for females with a university degree.

⁵ The estimates are converted into meaningful quantities (predicted probabilities) by taking the inverse of the link function, $g^{-1}(X\beta)$, before plotting the fitted values in the corresponding figures.

⁶ When not otherwise stated the results for models with more than one explanatory variable are reported as controlling for the other variables in the model.

⁷ Wald tests are used for individual parameter estimates; whereas likelihood ratio tests are used for categorical variables with multiple parameter estimates.

[Insert Figure 2 Here]

Model 3 is included in the analysis to determine whether the relative employment outcomes for male and female graduates of different postsecondary programs change when the control variables are included in the model.⁸ The estimates in Model 3 are converted into fitted probabilities and plotted in Figure 3, holding the control variables constant at typical values.⁹ The pattern of the estimates in Figure 3 is quite similar to the pattern displayed in Figure 2, except that the control variables appear to explain some but not all of the group differences in full-time employment status. The difference in full-time employment status between coop and non-coop programs remains statistically significant for male college graduates and female undergraduates. Likewise, significant gender gaps in the probability of being employed full-time remain for all pairwise gender contrasts, except for university coop graduates where the control variables appear to account for most of the observed differences in full-time employment status.

[Insert Figure 3 Here]

Earnings

The same series of regression models are estimated in Table 3, where the response variable is earnings. The estimates in Model 1 reveal that the effect of program type on earnings is statistically significant ($p < .001$). To provide meaningful contrasts, these estimates are converted to earnings and plotted in Figure 1. The most notable observation from this graph is that college and university graduates of coop programs earn significantly more than their counterparts in traditional non-coop programs. The earnings advantage for graduates with cooperative credentials is particularly strong among university graduates; they earn approximately \$8,000 more per year than their counterparts with traditional (non-coop) undergraduate credentials. In comparison, the earnings advantage for graduates of coop programs at the college level is considerably smaller; it is approximately \$2,000 per year. Figure 1 also

⁸ To save space the estimates and corresponding tests of statistical significance for the control variables are not discussed; however, they are provided in Table 1.

⁹ Means are used for quantitative variables and proportions are used for categorical variables.

reveals that the earnings of trades graduates and college graduates of traditional non-coop programs are especially low; they earn less than \$30,000 per year, two years after graduation.

[Insert Table 3 Here]

[Insert Figure 4 Here]

The estimates in Figure 5 are based on the results from Model 2, which includes variables for gender and the interaction between gender and postsecondary program. The confidence intervals in Figure 5 indicate that all pairwise gender comparisons are statistically significant. Interestingly, the gender gap in pay is highest among graduates of trades programs and graduates of coop programs at both the college and university level. Among community college graduates coop programs significantly improve earnings for males but not females. Among university graduates females coop graduates and especially male coop graduates report significantly higher earnings than their counterparts of traditional (non-coop) programs.

[Insert Figure 5 Here]

Model 3 includes the controls for the sociodemographic variables marital status, language of interview (English or French), visible minority status, mother's and father's education, age and age squared,¹⁰ as well as the variables relating to scholarship funding and field of study. Similar to the procedure used to obtain the estimates in Figure 3, the estimates for the postsecondary program are converted to earnings and plotted in Figure 6, while holding the control variables constant at typical values. In comparing the estimates in Figure 6 with Figure 5, it appears that some of the earnings advantage experienced by both male and female graduates of coop programs is explained when the controls are included in the model. However, there are significant disparities in earnings that are not explained by the control variables in the model. The potential implications of these findings on public policy and future research are discussed below.

[Insert Figure 6 Here]

¹⁰ Preliminary diagnostics reveal a curvilinear relationship between age and earnings. Thus, a quadratic regressor for age was added to the model. Polynomial contrasts were used for age and age squared to adjust for multicollinearity.

Discussion and Conclusions

When the descriptive results from this study are compared with the estimates from research, they indicate that at the university level alone, there were nearly three times as many graduates of coop programs in 2000 than there were in 1990. The descriptive results also reveal changes in the composition of coop programs. For example, while coop programs still are more common in fields such as commerce, engineering, and mathematics, their popularity has expanded to other fields as well. In fact, more than 25 percent of postsecondary graduates who completed a cooperative program in 2000 are from the social sciences, health sciences, or fields relating to education. There has also been an explosion in coop programs at the community college level. More than half of the cooperative postsecondary graduates in 2000 are from community colleges, whereas past research indicates that an overwhelming proportion (93 percent) of coop graduates had received a bachelor's degree in 1990 (see Darch, 1995).

The descriptive analysis of the NGS data also reveals just how popular coop programs are in Ontario relative to other regions of the country, especially Quebec. For example, 62 percent of coop graduates live in Ontario, whereas only 11 percent reside in Quebec. The disproportionate number of postsecondary graduates with cooperative credentials in Ontario could be due to the recent expansion of technical universities in the metropolitan Toronto area (e.g., Ryerson and the Ontario Institute of Technology) and the recent proliferation of colleges of applied arts and technology that offer degree programs. While future research on regional differences relating to coop programs is needed, these findings provide preliminary insight to policy makers and institution officials who are considering expanding cooperative opportunities across the country.

The regression results provide strong evidence to support the commonly held belief that coop programs help to ease school-to-work transitions for postsecondary graduates in the new economy,. However, the relative labour market advantages experienced by graduates of coop programs depends on whether the outcome is earnings or employment, and which level of

postsecondary education is considered (college versus university). In terms of securing full-time employment, coop programs provide the greatest advantages to male college graduates and female university graduates. With respect to earnings, coop programs provide the strongest advantage at the university level, particularly among males. This finding is especially noteworthy as past research has not emphasized gender differences when examining the labour market returns to a cooperative education. Even after including controls for sociodemographic characteristics and field of study, there is still a sizeable wage gap between graduates of coop programs and traditional postsecondary graduates. Thus, the relative labour market advantage for coop graduates over graduates of traditional programs is largely attributable to the actual value of the credential, rather than characteristics of graduates in the different programs (i.e., the control variables in this analysis).

Even though coop programs were nearly three times as common in 2000 as they were 10 years earlier (see Darch, 1995), the findings from this study suggest that the relative labour market outcomes are just as strong, if not stronger, at the university level than research on 1990 university graduates identified (Darch, 1995). Thus, the increased supply of cooperative programs has not had a negative impact on the relative labour market returns for university graduates with a cooperative education. The lower relative payoffs of a cooperative education for community college graduates could, in part, be attributable to the perceived value of a college cooperative education on behalf of employers, as well as the larger supply of coop graduates at the college level.

Since the results from this study are based on the most recent data available for both college and university graduates of all fields of study, surveyed at the same point in time, it provides a more current and thorough analysis of the relative labour market outcomes of a cooperative postsecondary education than is available in the existing literature. However, future research can build on these findings by documenting changes among current, past and future postsecondary cohorts. Furthermore, when the five year follow-up to the 2000 NGS becomes

available at Statistics Canada's research data centres, social and policy researchers will be able to determine whether recent graduates of cooperative programs are able to maintain their relative labour market advantages over the early stages of their careers.

Still, the relative advantages of a cooperative education needs be explored further. For example, research which compares graduates of other cohorts would be valuable to determine the extent to which these findings are attributable to cyclical or economic trends. As well, longitudinal research is needed to assess the long-term costs (in terms of tuition and time) and benefits (lifetime earnings) of acquiring a postsecondary cooperative credential. Nevertheless, these results provide preliminary evidence that youth employment policy should acknowledge the labour market advantages that cooperative postsecondary programs provide to students making their school-to-work transitions in the new economy. The results are also relevant to policy officials in Canada who contribute to decisions relating to the funding of postsecondary programs, including the setting of tuition levels. Guidance counsellors and employment centre administrators responsible for assisting students with postsecondary decisions will also find this information useful.

Finally, the findings will be especially valuable for helping students who are navigating the postsecondary education system to make informed decisions regarding the relative labour market payoffs of a postsecondary cooperative credential. Finally, given the increasing expense of acquiring a higher education, in terms of both time and money, prospective students will find these results particularly useful.

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Table 1. Descriptive statistics for the variables used in the study, separately for coop and non-coop programs (excluding graduates of trades programs)

Variable	Non-Coop <i>Proportion / Mean</i>	Coop <i>Proportion / Mean</i>	
Sex			***
Female	0.61	0.55	
Male	0.39	0.45	
Marital Status			***
Single/Previously married	0.64	0.68	
Married/Common law	0.36	0.32	
Number of Children			***
One child	0.10	0.11	
Two or more children	0.09	0.06	
No children	0.81	0.83	
Language			***
French	0.21	0.12	
English	0.79	0.88	
Visible Minority Status			*
Visible Minority	0.16	0.18	
Non Minority	0.84	0.82	
Mother's Education			**
No Postsecondary Education	0.61	0.60	
Postsecondary Education	0.39	0.40	
Father's Education			***
No Postsecondary Education	0.56	0.54	
Postsecondary Education	0.44	0.46	
Region			***
Atlantic Provinces	0.08	0.07	
Quebec	0.21	0.11	
Ontario	0.42	0.62	
Western Provinces	0.29	0.21	
Program			***
Trades	--	--	
College	0.41	0.58	
University	0.59	0.42	
Field of study			***
Education	0.11	0.08	
Arts, humanities and related fields	0.12	0.03	
Social sciences	0.15	0.08	
Commerce and business	0.20	0.29	
Mathematics, physical and biological sciences	0.12	0.16	
Engineering	0.12	0.22	
Health-related fields	0.15	0.10	
Other	0.03	0.04	
Scholarships			***
No	0.76	0.72	
Yes	0.24	0.28	
Age	28	27	**
Earnings (CDN)	\$35,551	\$40,699	***
n	13676	2802	

* p<.05; ** p<.01; *** p<.001

Table 2. Logistic regression model of full-time employment for male and female postsecondary graduates of coop and traditional non-coop programs.

	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
Constant	2.473		3.452		2.819	
Postsecondary Program						
College (coop)	0.091	0.130	0.384	0.307	0.609	0.313 *
College (non-coop)	-0.249	0.084 ***	-0.419	0.170 **	-0.034	0.177
University (coop)	0.792	0.174 ***	0.160	0.275	0.206	0.282
University (non-coop)	-0.321	0.084 ***	-0.784	0.166 ***	-0.022	0.182
Trades	---	---	---	---	---	---
Sex						
Female			-1.745	0.172 ***	-1.020	0.184
Male			---	---	---	---
Postsecondary program*Sex						
College (coop) * Female			-0.114	0.341	-0.342	0.346
College (non-coop) * Female			0.537	0.197 **	0.392	0.202 *
University (coop) * Female			0.979	0.360 **	0.785	0.365 *
University (non-coop) * Female			0.990	0.194 ***	0.534	0.203 **
Marital Status						
Single/Previously married					-0.031	0.058
Married					---	---
Visible Minority Status						
Non minority					0.006	0.079
Visible Minority					---	---
Number of Children						
One child					-0.289	0.080 ***
Two or more children					-0.395	0.086 ***
No children					---	---
Language						
French					0.351	0.127 **
English					---	---
Mother's Education						
Postsecondary education					0.028	0.061
No postsecondary education					---	---
Father's Education						
Postsecondary education					-0.028	0.059
No postsecondary education					---	---
Region						
Quebec					-0.402	0.135 ***
Ontario					-0.151	0.094
Western Provinces					-0.133	0.080
Atlantic Provinces					---	---
Scholarships						
Yes					0.203	0.069 ***
No					---	---
Age					-0.020	0.003 ***
Field of study						
Arts, humanities and related fields					-0.168	0.103
Social sciences					0.404	0.121 ***
Commerce and business					1.026	0.108 ***
Mathematics, physical and bio sci					0.833	0.113 ***
Engineering					1.834	0.143 ***
Health-related fields					0.169	0.093
Other					0.318	0.138 *
Education					---	---
	n = 18,993		n = 18,993		n = 18,993	
	Log L = -5787.77		Log L = -5565.40		Log L = -5292.16	

* p<.05; ** p<.01; ***p<.001

Response variable: Whether the respondent is employed full-time: 1) employed full-time; 0) not employed full-time.

Table 2. Logistic regression model of full-time employment for male and female postsecondary graduates of coop and traditional non-coop programs.

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Father's Education						
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Region						*
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Atlantic Provinces					---	---
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* p<.05; ** p<.01; ***p<.001; Standard errors are in parentheses

Response variable: Whether the respondent is employed full-time: 1) employed full-time; 0) not employed full-time.

Figure 1

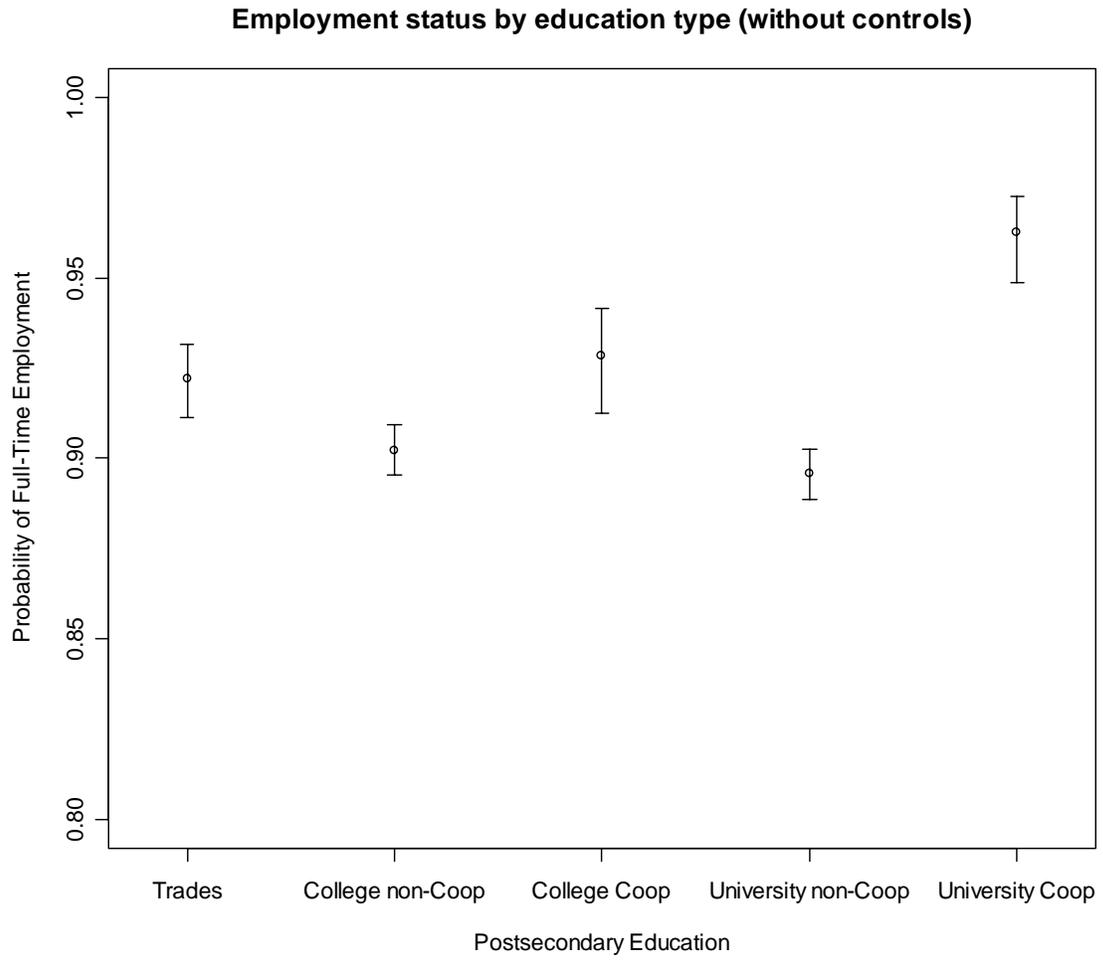


Figure 2

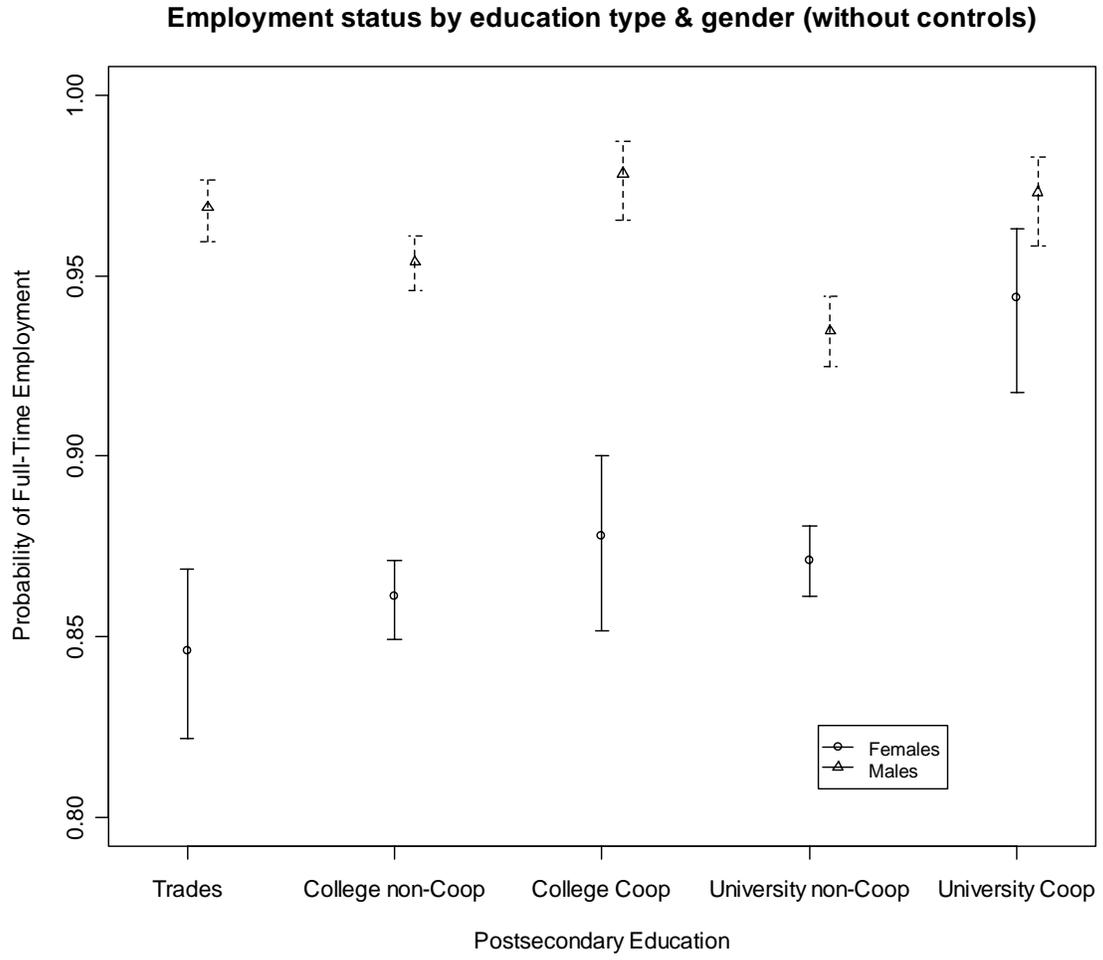


Figure 3

