

What can you expect from the post-secondary institution?*

Understanding the transition into the labor market after the post-secondary institution using
Logistic Regression

Yunkyung Park

22 April 2022

Abstract

The post-secondary education rate is increasing in Canada. Statistics Canada has been collecting data on the labour market experiences of graduates from universities and community colleges in Canada since 1978. In this paper, we used the 2018 National Graduates Survey and focused on the relation between education experience and labour market outcomes. We observed that 20.93% of the respondents already found a job before completing the degree and 26.41% of the respondents took less than 6 months to find their first job after the graduation. The analysis of the experiences and outcomes of graduates provides insight into a better understanding of the post-secondary education.

keywords: Post-secondary institution, post-secondary education, life after graduation, transition into the labor market, student debt, logistic regression

1 Introduction

It was reported that 73% of Canadians aged 25 to 34 had earned a post-secondary qualification in 2019 compared to 59% in 2000 (Statistics Canada, n.d.b). As generations these days are more likely than previous generations to have completed a post-secondary education, it is important to understand the factors related to entry to college or university. One of the reason is a greater earning potential after completing the degree. Individuals who have completed post-secondary education tend to make more money and their growth in earnings over their lifetime is more likely to be higher than those who does not have the degree (Ostrovsky and Frenette, n.d.). In addition, they are expected to get the greatest social, economic, and personal returns from post-secondary education. To verify whether the post-secondary institution is close to what they expected before entering, this paper analyses the survey conducted on graduates of public post-secondary educational institutions in Canada in the calendar year 2015. The survey was conducted in 2018, which is three years after the graduation of the respondents, and this paper examines their experiences during the program and their life after the graduation.

The paper contains two sub-topics. The first topic is on the experiences during the program. It mainly focuses on the programs taken in the institution such as whether the work placement was included and whether the international opportunity is available. In addition, it focuses on the factors that affected choosing the institution and the program. The second topic is on life after graduation. It puts emphasis on the transition into the labor market after the graduation such as the length of the time it takes to find a job and whether the job is related to their major.

The rest of the paper is divided into 4 sections. Section 2 explains how data was collected, the survey methodology, and key features of the survey, and Section 3 uses logistic regression to see how much the work experience such as co-op and work placement matters in finding their first job after graduation. Section 4 conveys the findings along with the graphs and tables made. Section 5 explains some interesting points found and discusses in more detail what was found and some limitations of this paper.

*Code and data are available at: https://github.com/parkyunk/postsecondary_institution.

2 Data

2.1 Data Collection

The data was obtained from the the 2018 National Graduates Survey (NGS). It is a cross-sectional survey designed to collect data from Canadian graduates of public post-secondary educational institutions. The survey was conducted by interviewing three years after graduation on the class of 2015. It was collected from June 7th to November 9th, 2018 by Statistics Canada. The questionnaire included 234 questions, and respondents could either self-complete the survey online or complete the survey by telephone with a Statistics Canada interviewer through a computer-assisted telephone interview (CATI).

2.2 Survey Frame

The 2018 NGS survey frame was created using administrative data obtained from public colleges and universities through the Post-secondary Student Information System (PSIS). A standard Classification of Instructional Programs (CIP) Canada 2016 code was assigned to all graduates on the frame at the time the record was added to PSIS. The CIP code was used in labeling the field of study variable, and it was further used to eliminate the frame graduates from programs that are not part of the target population.

2.3 Sampling Strategy

The 2018 NGS used a stratified simple random sample design. The sample selection of graduates within strata was done without replacement and using a systematic method. Two variables were used to divide the samples into strata; geographical location of the institution and level of certification. There were 13 geographical locations: the ten provinces and the three northern territories. In addition, there were 4 levels of certification: college, undergraduate, master’s and doctorate. The combination of these three variables made 52 strata in total. However, there were not graduates in every possible strata. Therefore, there were 45 strata created in final.

The target population corresponds to graduates of public post-secondary educational institutions in Canada in the calendar year 2015 who were living in Canada at the time of survey data collection in 2018. It excluded the graduates from private post-secondary institutions, graduates who completed “continuing education” courses, and graduates in apprenticeship programs.

The sample was designed to yield estimates of a minimal proportion of 5.5% with a maximum coefficient of variation (CV) of 10.47% for any of the 2018 NGS strata. Thus, the target sample size was 59,795. The overall response rate for the 2018 NGS was approximately 63%, with about 2/3 of the response cases self-completed online by respondents. There were 52 questions that were always asked regardless of questionnaire flow, and 11 of the 52 questions are selected to be the minimum response criteria. Only the cases that answered at least 9 of the 11 questions were considered respondents. There were 26 cases that were removed from the NGS submitted data as they did not meet the minimum response criteria and thus were deemed non-respondents.

2.4 Key features

The raw data includes 125 variables that were derived from the questionnaire. The dataset is processed and analyzed using ‘R’ (R Core Team 2021) mainly with the ‘tidyverse’ (Wickham et al. 2019) and ‘dplyr’ (Wickham et al. 2021) packages. The package ‘janitor’ (Firke 2021) is used to clean data, and the graphs and the tables are created in ‘ggplot2’ (Wickham 2016) and ‘kableExtra’ (Zhu 2021), respectively. The package ‘broom’ (Robinson, Hayes, and Couch 2022) is used to translate the result of logistic regression model into probabilities. The packages ‘bookdown’ (Xie 2016) and ‘knitr’ (Xie 2014) are used in generating the R Markdown report. Table 1 created using ‘kableExtra’ (Zhu 2021) shows a subset of key features that will be discussed in this paper.

Table 1: A subset of key features

Age at graduation	Gender	Level of study	Length of time until first job after graduation
Less than 25	Female	Bachelor's	Less than 6 months
Less than 25	Female	College	Less than 6 months
Less than 25	Female	Bachelor's	Less than 6 months
25 to 29	Male	Master's / Doctorate	6 months to less than 12 months
Less than 25	Male	College	Less than 6 months
25 to 29	Male	Master's / Doctorate	Less than 6 months
Less than 25	Female	College	Already working at a job or business
30 to 39	Female	College	NA
Less than 25	Female	Bachelor's	Already working at a job or business
Less than 25	Female	Bachelor's	NA

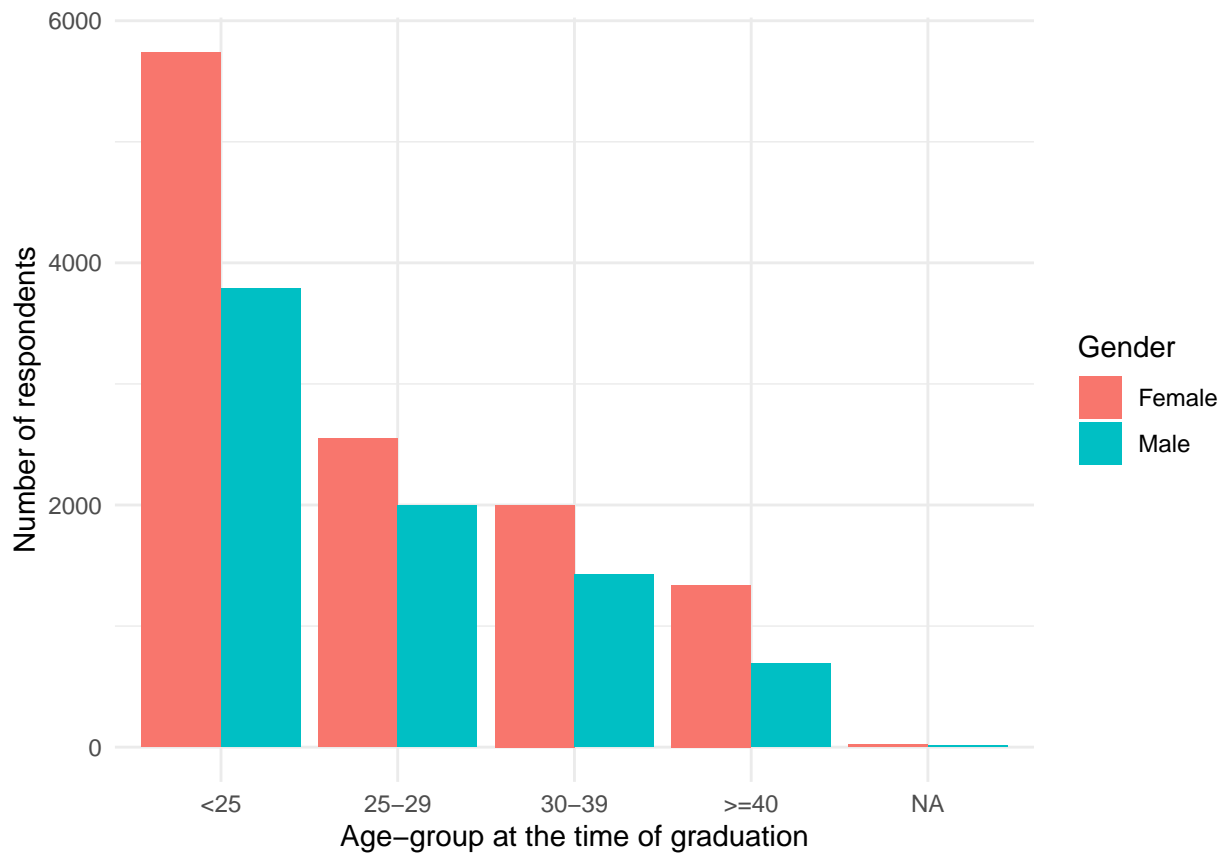


Figure 1: Distribution of age groups (at the time graduation) and gender

2.5 Overview

2.5.1 Age at graduation

Figure 1 shows the distribution of the age-group at the time of graduation. Note that the survey was conducted in 2018 on the Class of 2015, so by the time the survey was completed, we can expect that the age distribution of the survey would be slightly different. We see that more female graduated from post-secondary institution. It should be mentioned that since it is conducted to the ones who graduated, it does not tell that female tends to go to post-secondary institution more than male. In addition, we can tell that more than a half of the students graduate their post-secondary institution at the age of less than 25.

2.5.2 Level of study

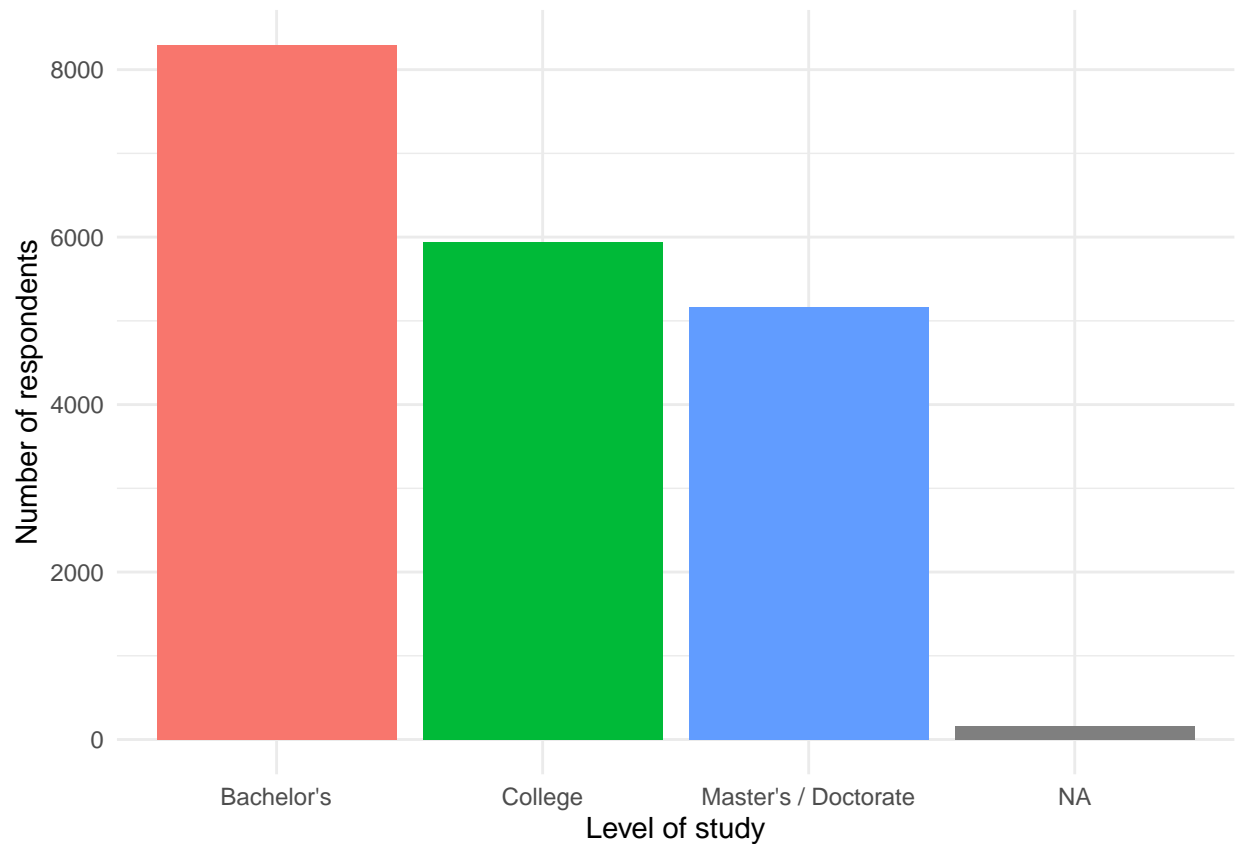


Figure 2: Distribution of level of study

Figure 2 shows that over 8,000 of the respondents have obtained the Bachelor's degree. Bachelor's, Master's, and Doctorate degree are obtained from the university, so it indicates that there are more graduates from the university than from the college. Master's and Doctorate degree can be obtained after they earn the Bachelor's degree, so the age distribution of the individuals who obtained Master's and Doctorate degree tend to be higher than that of the ones who obtained Bachelor's degree. Thus, the distribution of the level of study of the respondents shown in Figure 2 corresponds to the distribution of the age groups at the time of graduation shown in Figure 1.

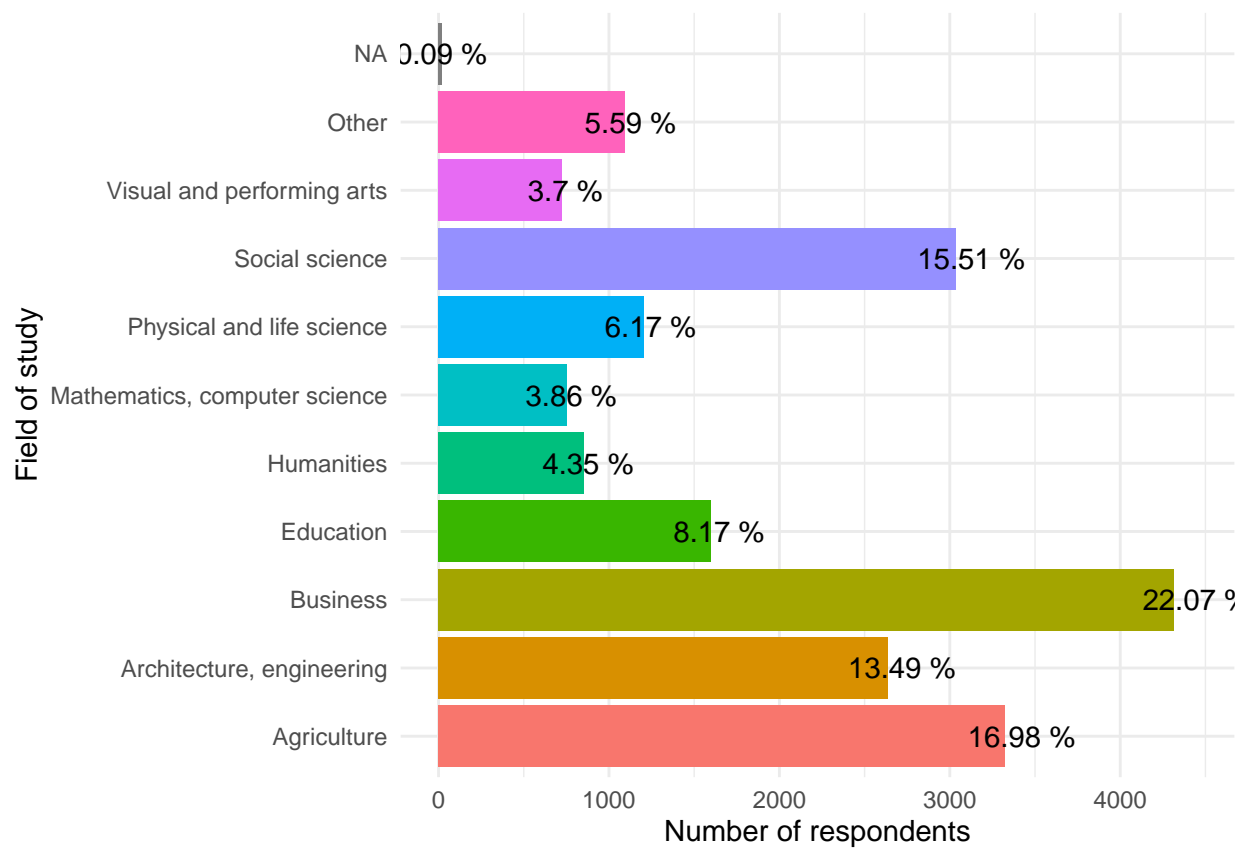


Figure 3: Distribution of field of study

2.5.3 Program

Figure 3 demonstrates that 22.07% of the respondents studied business in their institution, and 15.51% specialized in social science. However, less than 1,000 respondents studied mathematics or computer science. It is worth mentioning that computer science jobs are high in demand, but the number of individuals who majored computer science is low. Major field of study is classified according to the Classification of Instructional Programs (CIP) Canada 2016.

2.6 Length of time until first job

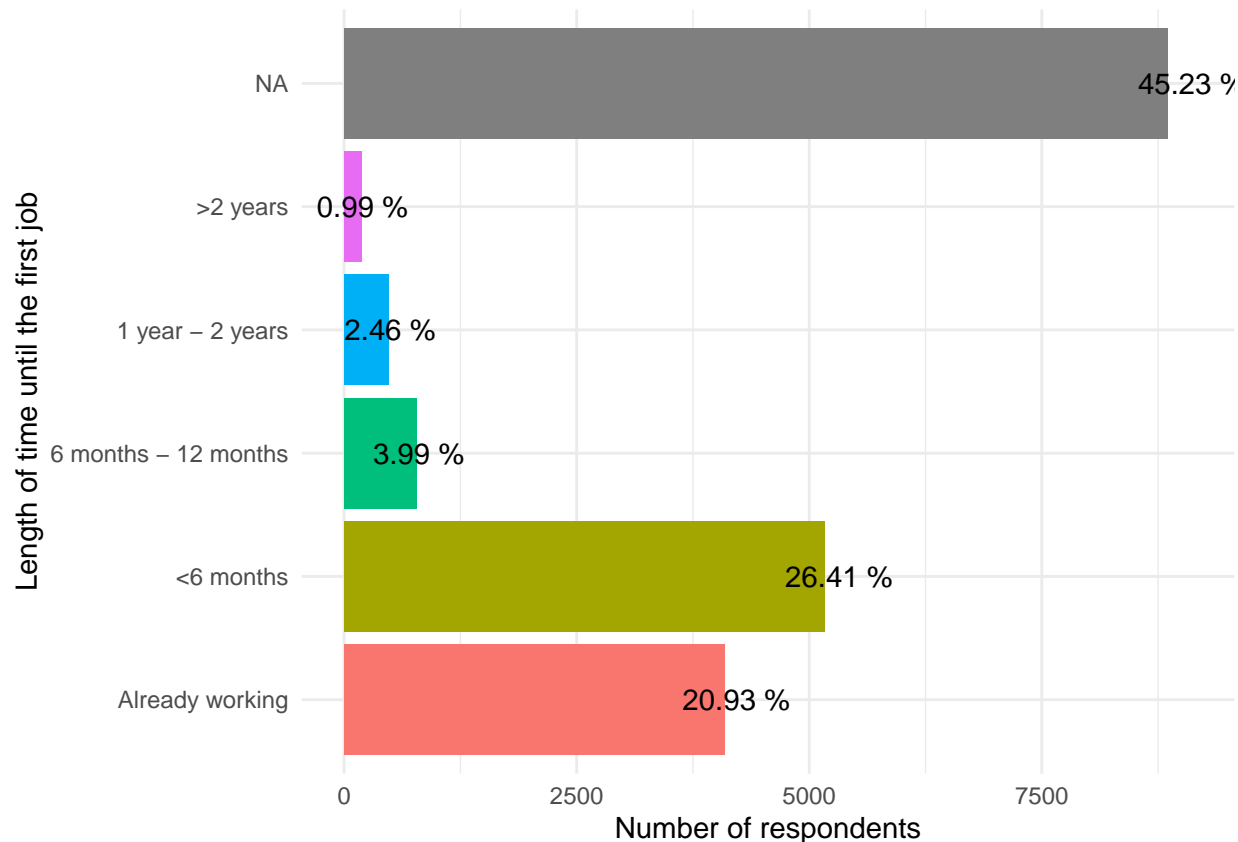


Figure 4: Distribution of the length of time it took until finding the first job

Figure 4 shows that approximately half of the respondents did not take long time to find their first job. 20.93% found their job before graduating, and 26.41% took less than 6 months to get their first job. However, it should be noted that 8,849 of the respondents did not answer this question. Even though it is not specified what those people mean, it includes the ones who could not find a job as well as the ones who chose not to work after graduating the institution.

3 Model

According to NACE's Job Outlook 2017 survey, it was reported that nearly 91 percent of employers prefer that their candidates have relevant work experience (NACE, n.d.). Most university students think that one of the first things an employer looks for is a high GPA. Although a high GPA may be very important for some jobs such as those in the fields of financial services or science, many surveys of employers show that

relevant work experience is what they seek most in their job candidates (NACE, n.d.). However, this is on employer's perspective. I will try to view it from the point of view of the ones who are seeking for jobs.

Logistic model requires the dependent variable to have a binary outcome. So, I adjusted a variable named 'time until first job' to make it into binary outcome. If an individual was already working at the time of graduation or took less than 6 months to find their first job, I marked them short to indicate that it took them a short amount of time to find the first job. On the other hand, if they took more than 6 months, I marked them long to indicate that they took relatively a long time to find the first job.

On top of that, I would like to see the importance of the work experience in getting a first job. Since Co-op and work placement are the only variables available in this dataset which can be considered relevant work experiences, I created a new variable named 'work experience' which indicates whether they have a work experience or not. If a respondent reported that they have either participated co-op or had a work placement in the program, then I claimed that they have relevant work experience; if the respondent answered no in both co-op and work placement, then I marked no in work experience.

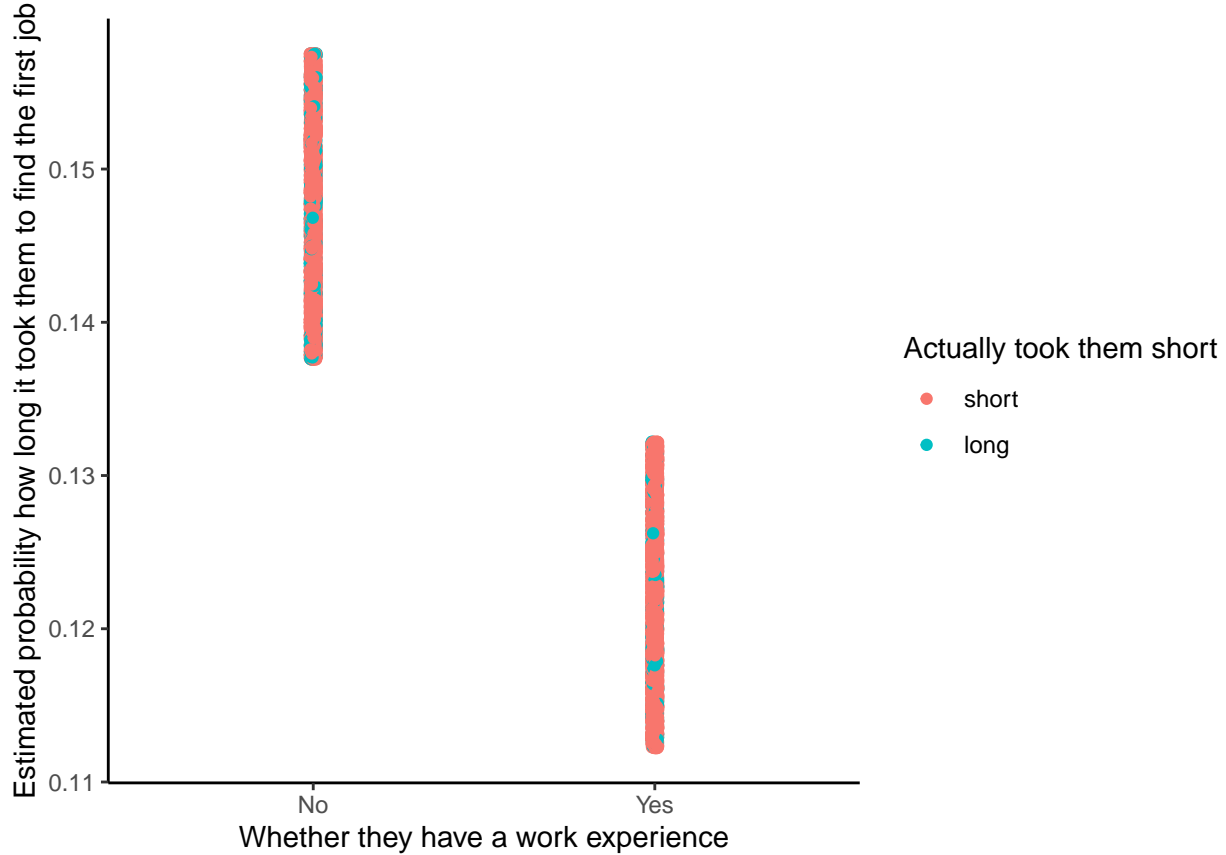
Let y denote transition into labor market and β_1 indicates whether they have a relevant work experience or not. If they do, then $\beta_1 = 1$. Otherwise, $\beta_1 = 0$.

$$\Pr(y = 1) = \text{logit}^{-1}(\beta_0 + \beta_1 x)$$

```
##
## Call:
## glm(formula = transition_into_labor_market ~ work_experience,
##      family = "binomial", data = ngs0)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -0.5651  -0.5651  -0.5106  -0.5106   2.0504
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -1.75390    0.03739  -46.905 < 2e-16 ***
## work_experienceYes -0.21777    0.05707   -3.816 0.000136 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 8498.1  on 10701  degrees of freedom
## Residual deviance: 8483.5  on 10700  degrees of freedom
## AIC: 8487.5
##
## Number of Fisher Scoring iterations: 4
```

Table 2: Sources of experience (in %)

Experience	Yes	No	NA.
Work	73.63	26.28	0.09
Volunteer	46.90	52.86	0.24
Work placement	46.67	53.19	0.14
Participated Co-op	10.56	89.24	0.21
Entrepreneurial course	8.13	91.27	0.59
International	5.92	93.93	0.15



```
##           Truth
## Prediction short long
##      short 1853 288
##      long   0   0
```

4 Results

4.1 Experiences during the program

Table 2 illustrates that 73.63% of the respondents worked during the program. Their work may be related to their career but it may not be. While 46.67% had work placement in their program, 10.56% participated co-op. Both work placement and co-op provide an opportunity for students to bridge academic skills and theory to continuous learning in the workplace, but co-op programs are usually 4 months long and occur May to August whereas work placements are integrated learning experiences and are usually scheduled during the final semester of a post-secondary program (Department, n.d.). On the other hand, only 5.92% have

experienced international experience during the program. However, it is worth mentioning that international students comprised 11% of Canada's post-secondary enrollment in the 2015-2016 academic year (Statistics Canada, n.d.a). An international opportunity might not look as attractive to international students.

4.2 Job related to the program

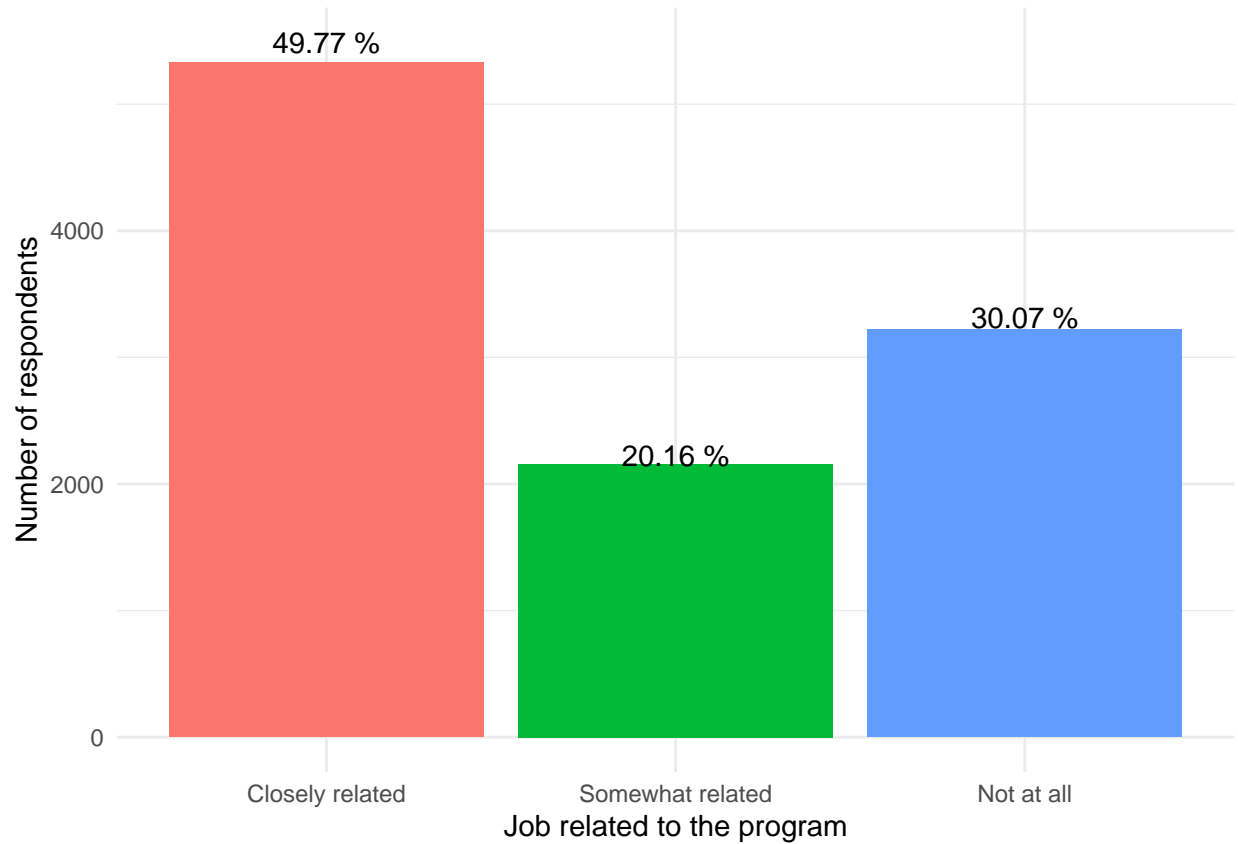


Figure 5: Distribution of the respondents whether their job is related to the program

Figure 5 demonstrates that more than two-thirds of the respondents said that their job is related to the program that they studied in the post-secondary institution. In detailed, 49.77% responded that their job is closely related to their post-secondary program, and 20.16% responded that their job is somewhat related. However, approximately one-third found a job that is not related to what they studied in the post-secondary institution at all. Note that I purposely excluded 8,849 respondents, who did not answer the question related to the length of time until the first job as shown in Figure 4. They already told us that the institution does not help to get a job and does not tell anything more about the relation between the job and the program.

4.3 Sources of funding

Table 3 illustrates that it is most likely for the post-secondary students to pay their tuition by earning. In other words, they tend to afford their tuition by their own. Next, they are likely to receive a support from their parents. On the other hand, only 8.13% of the respondents have received a financial support from their employer.

Table 3: Sources of funding

Source	Yes	No	NA.
Earnings	67.96	30.72	1.32
Parents	50.64	48.04	1.32
Government student loans	47.75	52.12	0.13
Scholarships	35.97	62.71	1.32
Government grants	23.20	75.48	1.32
Bank loans	20.20	78.48	1.32
RESP	16.87	81.80	1.32
Credit cards	15.48	83.19	1.32
RA/TA	12.29	86.38	1.32
Non-government grants	11.95	86.73	1.32
Employer	8.13	90.55	1.32

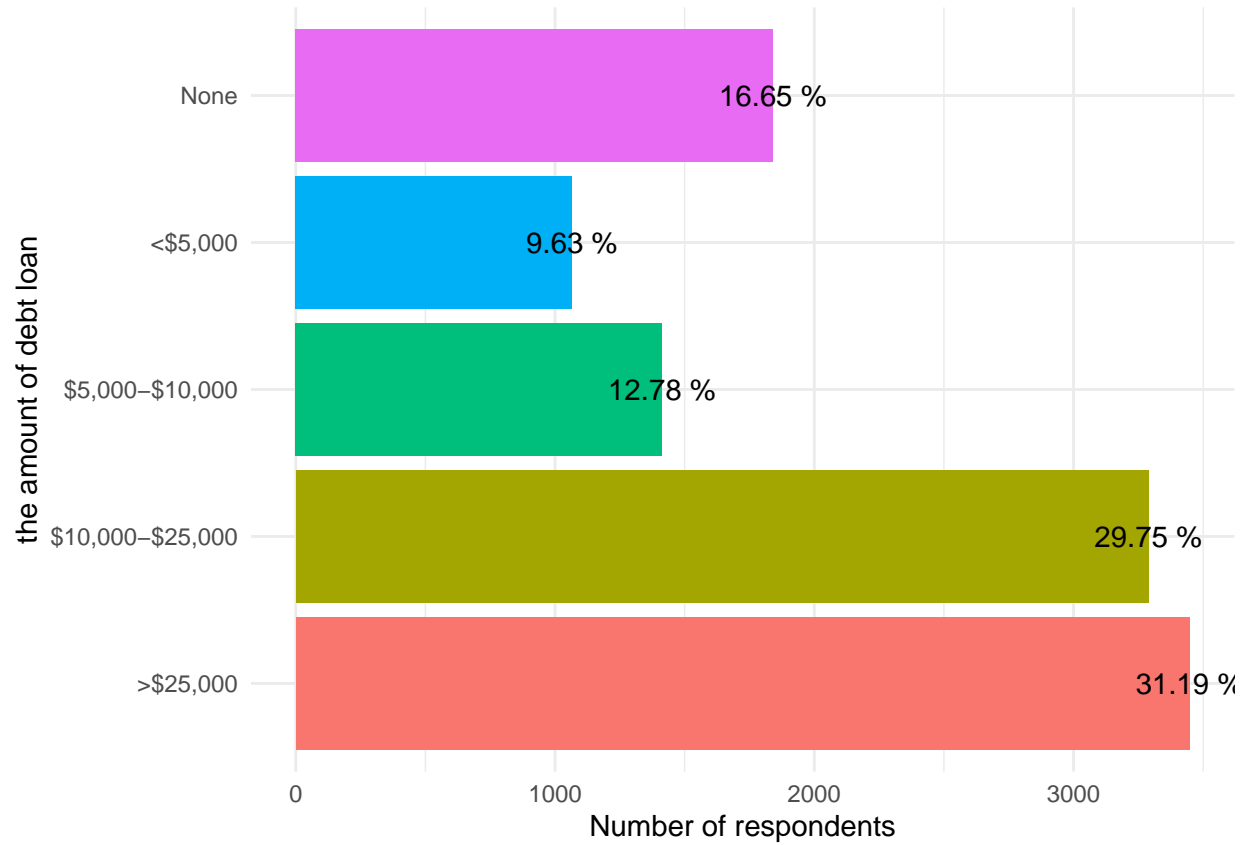


Figure 6: Distribution of amount of debt loan at the time of graduation

4.4 Debt Loan at the time of graduation

It can be observed from Figure 6 that 31.19% of the respondents graduated with a debt loan greater than \$25,000, and 29.75% graduated with a debt greater than \$10,000. It is reported that 16.65% did not have any debt loan at the time of graduation. The dataset included 8,508 respondents who did not answer this questionnaire, and we purposely excluded them in plotting the graphs as they do not tell anything about the data itself and it is unclear what they mean.

5 Discussions

5.1 During the program

5.2 Debt loan

Table 3 shows that 47.75% received government student loans, and 23.20% received government grants. Note that every loan needs to be pay back whereas grants need not to be repaid (Granted Consulting, n.d.). Loan can be thought as borrowing money, so you need to pay back the amount that you borrowed as well as pay the interest rate (Granted Consulting, n.d.). On the other hand, grants is the financial award, so it does not have to be repaid (Granted Consulting, n.d.). We can observe from Table 3 that it is more likely to receive loans than grants. Besides government student loans, 20.20% got a loan from the bank.

Figure 6 demonstrates that more than a half of the respondents graduated with a debt loan greater than \$10,000. In particular, approximately one-third of the respondents said that they had more than \$25,000 of debt at the time of graduation. It was reported that it takes ~10 years on average to pay off a debt of \$10,000 with a 10% interest rate (???). The average salary of the graduates was reported to be \$38,000 in the survey of 2018 (???). Therefore, if we consider that they pay off \$100 every month, then it will take 15 years to pay off.

5.3 Limitations

Although this paper only focused on the program itself, throughout their education, there are lots of opportunities. There are many extra-curricular activities that are available such as club, workshops, conference, job fairs, etc. In addition, students get to meet many people with all different backgrounds. Since this paper did not take those into consideration, the post-secondary institutions offer a lot more opportunities than that are being discussed in this paper. Therefore, there are some limitations in this paper in that aspect.

They grouped Master's and Doctorate degree in one. However, they are quite different. Master's degree takes at most two years whereas doctorate degree takes five years on average. In addition, there are some professional Master's program.

References

- Department, Student Career Services. n.d. “Student Career Services Department.”
- Firke, Sam. 2021. *Janitor: Simple Tools for Examining and Cleaning Dirty Data*. <https://github.com/sfirke/janitor>.
- Granted Consulting. n.d. “The Difference Between a Grant and a Loan.” <https://granted.ca/the-difference-between-a-grant-and-a-loan/>.
- NACE. n.d. “Employers Prefer Candidates with Work Experience.” <https://www.nacweb.org/talent-acquisition/candidate-selection/employers-prefer-candidates-with-work-experience/>.
- Ostrovsky, Yuri, and Marc Frenette. n.d. “The Cumulative Earnings of Postsecondary Graduates over 20 Years: Results by Field of Study.” Statistics Canada. <https://www150.statcan.gc.ca/n1/pub/11-626-x/11-626-x2014040-eng.htm>.
- R Core Team. 2021. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Robinson, David, Alex Hayes, and Simon Couch. 2022. *Broom: Convert Statistical Objects into Tidy Tibbles*.
- Statistics Canada. n.d.a. “Postsecondary Enrolments, by Registration Status, Institution Type, Status of Student in Canada and Gender.” <https://doi.org/https://doi.org/10.25318/3710001801-eng>.
- . n.d.b. “Study: Youth and Education in Canada.” <https://www150.statcan.gc.ca/n1/daily-quotidien/211004/dq211004c-eng.htm>.
- Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. <https://ggplot2.tidyverse.org>.
- Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D’Agostino McGowan, Romain François, Garrett Golemund, et al. 2019. “Welcome to the tidyverse.” *Journal of Open Source Software* 4 (43): 1686. <https://doi.org/10.21105/joss.01686>.
- Wickham, Hadley, Romain François, Lionel Henry, and Kirill Müller. 2021. *Dplyr: A Grammar of Data Manipulation*.
- Xie, Yihui. 2014. “Knitr: A Comprehensive Tool for Reproducible Research in R.” In *Implementing Reproducible Computational Research*, edited by Victoria Stodden, Friedrich Leisch, and Roger D. Peng. Chapman; Hall/CRC. <http://www.crcpress.com/product/isbn/9781466561595>.
- . 2016. *Bookdown: Authoring Books and Technical Documents with R Markdown*. Boca Raton, Florida: Chapman; Hall/CRC. <https://bookdown.org/yihui/bookdown>.
- Zhu, Hao. 2021. *KableExtra: Construct Complex Table with ‘Kable’ and Pipe Syntax*.