GRADES AND LABOUR MARKET EARNINGS IN CANADA: NEW EVIDENCE FROM THE 2018 NATIONAL GRADUATES SURVEY

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ABSTRACT

This study examines how postsecondary education grades influence the labour market earnings of workers in Canada, and the moderating effects of field of study, level of study, gender, work experience while schooling, and other postsecondary educational qualification acquired since graduation. This study analyses cross-sectional data from the Public Use Microdata File of the 2018 National Graduates Survey (NGS) which follows the 2015 cohort of graduates three years after graduation. Unlike previous waves of the NGS, the 2018 data contain explicit information on the final grades obtained in postsecondary education programs. Using a two stage least square regression method, findings indicate that the overall grade point average is positively related to earnings, and this result is robust to model specification. This suggests that higher grades are important as they do translate into higher labour market earnings.

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CHAPTER 1

1.1 Introduction

Postsecondary education has many dimensions including grades and academic disciplines that provide individuals with the knowledge and skills required for employment and success in the labour market. Academic performance in postsecondary education institutions is assessed by the grade obtained in courses. Grades as a component of postsecondary education may play a role in ensuring success in the labour market. Employers may use grades obtained from postsecondary education to filter the pool of job applications. Therefore, graduates with higher grades will more likely get a job after graduation earlier than their counterparts with lower grades (Chia &Miller, 2008). Another benefit of postsecondary education grades is based on human capital theory, which proposes that higher levels of education lead to increased productivity and earnings. If different levels of education are associated with different levels of productivity, then different levels of academic achievement, as measured by grades, may also be associated with different levels of productivity and earnings. Hence, after getting a job, individuals with higher academic grades may be more productive and enjoy higher earnings than individuals with low grades (Neuman &Weiss, 1995; Smart, 1988).

Several studies applying human capital theory have confirmed that a relationship does exist between grades and earnings. While some studies have found grades to have a moderate to strong relationship with the earnings of workers (Kuncel et al., 2004; Thomas, 2000; Wise, 1975), others have found the relationship to be small or non- existent (Gemus,

2010; Loury &Garman, 1993). None of these studies were conducted with a Canadian population.

Very few researchers have identified the factors that confound the relationship between grades and earnings. At present, gender, parent's education, college choice and labour market experience have been identified as covariates. Although other demographic characteristics such as marital status, age, and place of residence may account for part of the relationship between grades and earnings, their confounding roles have not been extensively investigated. Loury & Garman (1993) found marital status to have a positive effect on both grades and labour market earning indicating that marital status correlates positively with both grades and earnings. Olitsky (2014) and Webber (2014) also found a positive relationship between grades and earnings after controlling for age. Chia & Miller (2008) on the other hand, after controlling for age found the grade-earning relationship to be negative. This shows that age correlates negatively with both grade and earning. However, Loury & Garman (1993) did not control for age but rather controlled for marital status and found a small positive relationship between grades and earnings. Chia & Miller (2008); Olitsky (2014) and Webber (2014) controlled for age but not marital status and they also found a positive grade-earning relationship. Therefore, it would be interesting to test for the direction of the grade-earning relationship after controlling for both age and marital status.

Job opportunities vary from one region to another. Individuals may have the same grades, but an individual's place of residence may give that person more opportunity to find a high paying job than another individual living elsewhere where opportunities of finding a high paying job may be less. Therefore, to control for this geographical influence

on earnings, place of residence can be another strong confounder. Other potential confounding variables include personality traits, leadership, and interpersonal skills which influence job performance and productivity, and in turn lead to higher earnings in the labour market (Wise, 1975).

Studies on the grades-earning relationship have not examined how the relationship could be different for individuals who were employed while studying as well as individuals who obtained additional education or training after graduation. Working full-time while pursuing postsecondary education can affect an individual's ability to pay attention to academic work. This may result in low grades which may reduce the individual's chances of getting a job after graduation and enjoying higher earnings. On the other hand, because such individuals already have labour market experience, they would have some knowledge and skills which can make them more productive and make them get job promotions faster than their counterparts who had no labour market experience. Hence, their educational qualification alone may be enough to ensure higher labour market earnings so obtaining higher grades may not matter. Regarding individuals who had no work experience before graduation, they are more likely to focus on their academic work than their counterparts who work while in school and hence they might have a higher chance of obtaining good grades and a high paying job after school. Another dimension that can be looked at is how the grade-earning relationship varies for individuals who obtained other educational qualifications after graduation. If an individual obtained any professional certificates, diploma, or degree after graduation, then the higher earnings observed may not be due to grades obtained. The higher earnings could be due to these additional qualifications which are important in predicting job promotion.

The relationship between grades and earnings can vary significantly among the various academic disciplines (Chia &Miller, 2008; Dalessio, 1986; Finnie et al., 2016). One would assume that higher grades may matter more in predicting higher earnings for humanities, social science, and business students who are having a harder time becoming established in the labour market, at least in the short-term, relative to engineering and computer science students who presumably have employers lined up for their services. A study by Dalessio (1986) confirms that grade point average (GPA) has a small significant relationship with earnings for graduates from the engineering field. The relationship between grades and earnings may be small or non-existent for fine arts graduates because most of the fine arts graduates may be people who want to establish their own private business so their ability to gather the resources needed to set up the business will be more important in predicting their earnings than their grades. Thus, the type of career such graduates find themselves in is likely to be less organized and more informal so their grades may not matter. This could apply to graduates from the other fields too.

Contrary to what is expected, there is a strong influence of grades on labour market earnings for individuals working in occupations that require educational qualifications in areas such as computer science, engineering, and other pure sciences (Neuman &Weiss, 1995; Smart, 1988; Spence et al., 1975; Thomas, 2000). The relationship between grades and earnings is weak among individuals in occupations requiring qualifications in the social sciences, humanities, and fine arts (Chia &Miller, 2008; Finnie et al., 2016)). For these individuals in the labour market, their earnings differences are poorly explained by their differences in academic grades. This could be so because, although better grades may improve their productivity and job performance, such improvement may not necessarily

translate into higher earnings for such individuals depending on the type of the job classification or occupation they find themselves in. If their job classification is low, then regardless of higher grades or higher productivity their earnings may still be relatively small.

To the best of my knowledge, only Finnie et al. (2016) have examined how the relationship between postsecondary education grades and labour market earnings vary by field of study in Canada. They found a positive grade-earning relationship for individuals who hold a bachelor's degree in mathematics and computer science, business, social science, and or a college diploma in arts and education. However, they found no significant grade-earning relationship for graduates with bachelor's degrees in the fine arts. The findings of Finnie et al. (2016) suggest that more studies are needed to better understand the relationship between grades and earning in the Canadian context.

1.2 Purpose of study

In Canada, many studies have examined the relationship between postsecondary education and labour market earnings, but only few discuss how academic achievement, measured by grades obtained, affects labour market earnings of these workers (Frenette, 2014; Heisz, 2003). The overall goal of my study is to examine how postsecondary education grades influence labour market earnings of workers in Canada, and the moderating effects of field of study, gender, work experience while schooling, level of study and other postsecondary educational qualification after graduation. The study seeks to address the following questions:

1. Is there a relationship between postsecondary education grades and labour market earnings and does the relationship remain significant after

controlling for demographic characteristics such as age, marital status, and gender?

2. Does the relationship between postsecondary education grades and labour market earnings vary by field of study, level of study and gender?
3. Is the relationship between grades and earnings different for individuals who were employed while enrolling in postsecondary education compared to those who were not employed?
4. Is the relationship between grades and earnings different for individuals who had other education or training after graduation compared to those who did not?

1.3 Contribution

Only one study to date, has investigated the relationship between postsecondary education grades and labour market earnings in the Canadian population due to scarcity of data on grades (Finnie et al., 2016). My thesis will contribute to the literature by examining how the relationship between grades and earnings vary across field of study. Grades are important to employers when they are deciding which applicants to choose for certain positions but so are leadership, interpersonal and other soft skills. Therefore, students often must decide how much time to spend studying and how much time to engage in extracurricular activities that will help them develop their soft skills. By studying how important postsecondary education grades are in predicting earnings, students will be able to effectively manage their time between studying and engaging in extracurricular activities. The results from my study should help students identify which grades will yield them the highest earnings. The results will also provide information to the government on

whether there is the need to implement policies or provide resources that would enhance academic achievement in postsecondary education institutions.

1.4 Thesis Organization

The remainder of the thesis is structured as follows. Chapter Two is the literature review and it discusses how postsecondary education grades influence labour market earnings using human capital theory and the screening or signalling hypothesis. Empirical literature on the grade-earnings relationship is also discussed in this chapter. Chapter Three discusses the study design, data sources, variables, and the analytical procedures used for model estimations. Results obtained from the estimation models are presented and discussed in Chapter Four. Finally, the policy implications of the results obtained in this study as well as the summary, conclusion, study limitations, and recommendations for future studies on this topic are discussed in Chapter Five.

CHAPTER 2

2.1 Theoretical framework: Human capital theory and the signalling/screening hypothesis

Studies examining the relationship between academic grades and earnings have relied on human capital theory and the signalling/screening hypothesis (Smart, 1988; Thomas, 2000). Both have been used to explain why higher postsecondary education grades may lead to higher earnings for individuals in the labour market. The core idea of human capital theory is that individuals with higher levels of education and work experience have higher productivity and hence enjoy higher labour market earnings (Neuman &Weiss, 1995).

Investment in education is one form of human capital investment. The theory posits that education provides individuals with knowledge and skills. These knowledge and skills make the individual more productive and thus ensures higher earning power in the labour market. Hence, individuals with higher education will be more productive and enjoy higher labour market earnings than individuals with lower education.

As a limitation, human capital theory ignores other factors like technological changes, leadership, interpersonal, and other skills that contribute to labour productivity. Also, human capital theory focuses on only two benefits of education: higher productivity and higher earnings.

An extension of human capital theory is the signalling/screening hypothesis. According to the signalling/screening hypothesis, workers use education to signal their unobserved innate ability to employers, whiles employers use education to screen or filter

workers (Helmreich &Stapp, 1974; Spence et al., 1975). Individuals have other unobserved attributes that affect productivity, such as innate ability, and firms use education to make inferences about these unobserved attributes. Education also provides individuals with academic credentials. So, with the signalling/screening hypothesis, individuals with higher education earn higher incomes not because higher education makes them more productive, but because higher education provides them with academic credentials that provides a signal to employers about their unobserved ability which affects their productivity. Employers use these academic credentials to screen the pool of applicants and select the individuals best suited for the job. Thus, higher education acts as a filter and is used by employers to screen out more able workers rather than enhancing productivity directly.

Based on the core ideas of the signalling/screening hypothesis and human capital theory, if those with higher education have higher earnings prospects than their counterparts with lower levels of education, then different grade groups may also be associated with different productivity and labour market earnings. But this is just an assumption on what the connection between grades and earnings should look like. The relationship between grades and earnings based on these two theories have been tested elsewhere. In the US, Donhardt (2004) found no significant earning differences between low academic achievers and high academic achievers for the 1997-2001 university graduate cohort in the first three years of their careers. Only one study has investigated these connections in the Canadian context (Finnie et al., 2016).

2.2 How do postsecondary education grades influence labour market earnings?

Most studies have shown that higher education leads to higher earnings for individuals (Blundell et al., 2001; Neuman &Weiss, 1995; Patrinos, 2016). Several other factors such as field of study, parent's level of education and income, labour market experience, leadership skills, interpersonal skills, among others can also lead to higher earnings (Blundell et al., 2001; Neuman &Weiss, 1995; Patrinos, 2016). However, postsecondary education has several other dimensions including academic grades, length of program, type of institution, and other factors that can individually affect labour market earnings. This section examines the effects of postsecondary education grades on labour market earnings. It also discusses how the basic ideas from human capital theory and the signalling/screening hypothesis have been used to examine the relationship between postsecondary education grades and earnings.

Academic grading systems vary according to the form of education, province and territory in which the university is located, and even the faculty. The grading system across universities includes percentages, letter grades, and grade point average (GPA). For instance, in Alberta, the letter grade A+ can be translated as a 4.0 grade point or a 4.3 grade point depending on the university (Finnie et al., 2016). Overall, grades are used to measure a student's academic achievements.

There is a belief that individuals' grades influence opportunities in the labour market. Individuals with relatively higher grades are believed to be more ambitious, hardworking, and have higher productivity than those with lower grades. The screening hypothesis suggests that in postsecondary institutions a student's aptitude is measured by their grades. When these students graduate, most of them have little or no work experience.

Hence, one approach that employers use to sort out the pool of applications they get from postsecondary graduates is to use the grades they obtained in school. As a result, individuals who graduate from postsecondary institutions with higher grades may have a better chance of getting a job after graduation, becoming more productive, and earn more money than individuals who graduate with lower grades.

If education enhances productivity as human capital theory proposes, then it is possible that different grades will have differential effects on the earnings of individuals in the labour market. To achieve good grades in postsecondary education requires certain characteristics such as self-discipline, good time management skills, interest in learning, and others which may contribute to higher labour productivity. Individuals who graduate from postsecondary institutions with low grades may not possess these important characteristics.

Increased productivity will ensure high job performance, higher chances of being promoted to higher paying job positions within the organization and higher job satisfaction. Therefore, individuals with good grades are likely to enjoy higher labour market earnings than individuals with lower grades because of their increased labour productivity. Academic grades may be an indicator of cognitive ability and potential to excel in the labour market (Reilly et al., 1993). Therefore, individuals with higher postsecondary education grades may have higher human capital. Studies by Wise (1975) have shown that academic success is one of the major determinants of job performance which is dependent on labour productivity. His study indicates that increases in college performance leads to increases in productivity and higher earnings. In contrast, Donhardt (2004) did not find any such relationship between academic achievement and higher labour market earnings.

When individuals graduate from postsecondary education initially, the signalling/screening hypothesis would be important in predicting their labour market outcomes in terms of getting a job. However, in the long run, it is higher productivity that will lead to better job performance and ensure job promotion as well as higher earnings in the labour market, so human capital theory would become stronger in predicting labour market outcomes. Hence, if we are measuring the effects of postsecondary education grades on labour market earnings in the first few years after graduation, the signalling/screening effect can be measured. By studying the effects of postsecondary education grades on earnings for a relatively longer period after graduation, human capital effects of grades can be measured accurately after controlling for leadership skills, interpersonal skills, among others.

It is important to note that several other factors confound the relationship between grades and earnings. First, parents with higher levels of education are more likely to be more involved in their children's schoolwork, create a conducive environment to stimulate learning at home, encourage their kids to perform better academically, and portray higher earnings as desirable to their children than parents who are relatively less educated (Brody &Flor, 1998). Also, individuals who are married may have a stronger motivation to work more for higher earnings in order cater for the family than their colleagues who are unmarried. Finally, the empirical literature shows that labour market earnings vary by gender (Olitsky, 2014). A study by Saint-Pierre (1996) shows that the earnings of workers increase in their early years, peak at the middle age, and then decline after their mid-forties. These indicate that gender, age, marital status and parent's level of education can have

some influence on earnings and grades and therefore when examining the relationship that exists between grades and earnings all these variables need to be controlled.

2.3 Empirical evidence on the relationship between postsecondary education grades and labour market outcomes

This section reviews empirical evidence on the relationship between postsecondary education grades and labour market outcomes. Several studies have examined the importance of grades in predicting labour market earnings, job performance, job promotion, job satisfaction, among others. Most of these papers have found grades to be a good predictor of success in the labour market.

In analyzing the earnings gap between science, technology, engineering and mathematics (STEM) and non-STEM holders by gender and academic achievement test scores, Olitsky (2014) used post-graduation survey data merged with individual American College Testing (ACT) scores. He used the average treatment effect to estimate the STEM and non-STEM graduates' differences in their average earnings. The study found that, for the first job after graduation, the earnings gap between STEM and non-STEM majors increased as ACT test scores increase.

Kuncel et al. (2004) examined how academic performance can predict career potential, creativity, and job performance by statistically aggregating research results across previous studies (i.e., a meta-analysis). The correlation between cognitive ability, as measured by grades obtained, and job performance was found to be positive. Cognitive ability was also found to have a strong positive correlation with the time spent to complete

graduate school. Thus, more able students are more likely to spend more time focusing on their graduate degree and completing early than students with low cognitive abilities.

In the US, James & Alsalam (1993) used the 1972 National Longitudinal Study of the High School Class (NLS) and the Postsecondary Education Transcript Study (PETS) data to investigate how college choice and academic achievement affects earnings. Using OLS regression, college GPA was found to be statistically significant and explained 3 to 8 percent of the variations in earnings. Using a fixed-effects model, the study also found that college choice explained 17 to 29 percent of the variation in earnings. However, when family background, choice of major, and labour market experience were controlled for, the relationship between GPA, college choice and post-graduation earning was statistically insignificant. This is because, a relationship exists between student's family background and GPA. Also, college major and labour market experience affects earnings.

Jones & Jackson (1990) found a larger GPA-earning relationship than what Wise (1975) found and their results also provided evidence in support of the human capital theory. However, they increased their sample to include 811 employees with an undergraduate degree from a large public university. The study followed four graduating cohorts (1977-80) five years after graduation and, using a standard wage model, their results also showed a positive GPA-earning relationship. Specifically, a one-point increase in GPA resulted in an 8.9 percent increase in annual earnings. However, this study suffered from sample bias because they focused on employees who graduated from only a single university and in a single firm and hence their results could be different if the sample size is increased to include graduates from different universities and/or multiple firms.

The grade-earnings relationship has also been found to be positive by Chia & Miller (2008). They used data from the Graduate Destination Survey that was matched with student records at the University of Western Australia to examine the determinants of the starting salaries of graduates from 2002 to 2004. Using a standard earnings equation, their results indicated that a one-mark increase in the weighted average mark (fail to pass, pass to credit, credit to distinction, and distinction to high distinction) resulted in a 0.68 percent increase in graduate initial earnings.

In the US, Gemus (2010) examined the monetary benefits of college academic achievement, as measured by grade point average (GPA). The study used data on bachelor's degree graduates in the 1992/1993 school year obtained from the Baccalaureate and Beyond (B&B) survey data from the National Center for Education Statistics (NCES). The results from the study showed a positive and statistically significant association between GPA and earning 10 years after graduating from college with a bachelor's degree. For every one-point (A=4, B=3, C=2, D=1, F=0) increase in GPA, earnings increase by about 9%. The results also showed that, for graduate degree holders there was no relationship between GPA and earnings. This can be attributed to the small variations in grades because majority of the respondents in their sample had relatively higher grades.

There were some cases where grades had little or no effect on job performance. One of the earlier reviews on the relationship between grades and labour market outcomes was by Hoyt (1965). He found a very small, near zero correlation between grades and adult accomplishment. Ferris (1982) based his study on a sample of 250 employees in a large professional accounting firm. Level of education, the quality of educational institution attended, and the accounting grade point average were found to have a very small

relationship with job performance, measured by supervisor ratings. The study also found that, employees with the highest level of education enjoyed higher initial or starting salaries than those with relatively lower levels of education. The study did not find grades to be associated with the initial salary. These results indicate that, the firm places greater monetary value on having graduate education than on academic achievement. However, these results could be underestimating the actual relationship between grades, job performance, and salary because all the respondents in the sample had reasonably high grades and so it is difficult to know how job performance and the salary would be affected by the low-grade point average.

Dalessio (1986) attempted to examine how academic achievement, as measured by undergraduate GPA, affect job performance for 113 engineers and scientists in an engineering and research firm. The study used four measures of job performance: promotion rate, salary, supervisory ratings, and reports authored. The study found a small statistically significant correlation between GPA and both employee salary and the rate of promotion. Since the correlation between GPA and salary and the promotion rate was very small, and GPA did not have any correlations with supervisory ratings and reports authored, this implies that managers should not focus entirely on grades when making their hiring decisions.

Using a meta-analysis technique, Bretz Jr (1989) found a very small relationship between GPA and job satisfaction for females with an MBA, and a small relationship between GPA and starting salaries for males with MBA. Overall, the study showed that college grade point average was a poor predictor of occupational success as measured by job satisfaction and starting salary. However, salary growth had significant positive

relationship with the hours worked and the length of job tenure in an organization. The reason is that, grade point average is not a valid predictor of occupational success because it is too subjective and situation specific.

Donhardt (2004) investigated the effects of academic achievement on the earnings of bachelor's degree holders in the three years following graduation. The study merged unemployment insurance records with student administrative data to measure the quarterly earnings of the 1998 to 2001 university graduate cohort (a total of four cohorts), three years after graduating. In this paper, he regressed quarterly earnings on grade point average while controlling for gender, major, age, registration type, race, and industry. The major finding was that, better grades did not translate into better post-graduation earnings. Individuals who had a 4.0 GPA received $659.90 less in the first quarter than those with 3.0 GPA. Overall, the study found no significant earning differences between low academic achievers and high academic achievers in the first three years of their careers. However, this study focused on a single institution and one state in the US, and so the results could be different if extended.

Studies by Finnie et al. (2016), Miller & Volker (1984) and Thomas (2000) have shown that grades and labour market earnings relationship varies for males and females. Higher grades have consistently been associated with higher earnings among males. However, for females the relationship is not clear cut. In some studies, females who have higher grades from postsecondary institutions tend to report higher earnings than those with lower grades. However, many other studies have not found any significant differences in earnings between females with higher and lower grades (Chia &Miller, 2008). These findings indicate that while grades are an important predictor of higher earnings for males

in the labour market, they may have limited influence on what females earn from the work they do. This is because, females face more discrimination in the labour market in terms of earnings than males (Barahmand, 2008). As a result, even when they have the same grades as their male counterparts they still tend to earn less.

Loury & Garman (1993) studied the GPA-earnings relationship across race in the US for male college graduates. Using data from the National Longitudinal Study (NLS) of the 1972 high school class, the study found that a one-point increase in college GPA was associated with about a 6 percent increase in earnings for whites, and about 27 percent increase in earnings for blacks.

On one hand, some studies have identified that grades are important predictors of job performance, promotion rate, and earnings (Kuncel et al., 2004; Oehrlein, 2009; Thomas, 2000; Wise, 1975). On the other hand, studies have also found little or no significant relationship between grades, job performance, and earnings (Bretz Jr, 1989; Dalessio, 1986; Donhardt, 2004; Ferris, 1982). However, there are several academic disciplines in postsecondary education institutions and grades in each discipline vary. Grades in some fields may be more important in predicting labour market success than grades in other fields. Hence, if the study is based on how grades in general affect labour market outcomes, the results may be misestimating the true effects of grades. So far, only a few studies have been able to study the effects of grades on labour market success by field of study (Chia &Miller, 2008; Olitsky, 2014). Studies on the grade-earning relationship particularly in Canada are scarce. Only one study has examined the grade-earnings relationship by field of study in Canada.

Finnie et al. (2016) examines the effects of high grades on labour market earnings in Canada. The report uses data on each graduate's cumulative grade point average linked with their tax records held at Statistics Canada. They distribute the postsecondary education grades into three grade groups; high, middle and low, and focused on the 2005 to 2012 graduating cohorts (a total of eight cohorts). They find that males with bachelor's degrees in mathematics and computer science, business, and college diplomas in arts and education, and females with bachelor's degrees in the social sciences experience a stable positive grade-earning relationship in their early labour market career. They also find that postsecondary education grades do not translate into better post-graduation earnings for individuals with a bachelor's degree in Fine Arts. This provides evidence that the grade-earnings relationship varies significantly among the various academic disciplines.

The findings from empirical literature on how grades obtained from postsecondary education predict labour market earnings is inconclusive. Some studies have found little to no relationship between grades and earnings, but majority of the literature have found that higher grades lead to higher labour market earnings. However, significant variations are observed across academic disciplines. The effects of grades on earnings are higher for those with postsecondary education in the STEM fields compared to those with social sciences, humanities and fine arts qualifications. Several factors operating at the individual level and within the labour market play confounding roles in the relationship between grades and earnings. A major limitation of this literature is that most of these studies have focused on graduates from only a single postsecondary education institution and employees from a single firm. Because of this small sample size, their results cannot be interpreted as reflecting the true relationship between grades and labour market outcomes.

Also, most of the studies reviewed were conducted in Australia and the US. Only one study to date, has investigated this issue in the Canadian population. Since Australia and the Canadian context are quite similar in terms of the structure of postsecondary education institutions and employment opportunities, one may assume that the relationship that was found between grades and earnings in Australia can also be found in Canada. Details on the study design, data sources, variables, and the analytical procedures to be used for model estimations in this study are discussed in the next chapter.

CHAPTER 3

3.1 Methodology

In this chapter, the study design, data sources, and the variables appropriate for this study are described. Analytical procedures used for model estimations will also be discussed in this chapter. Finally, descriptive statistics such as frequency distributions, means and medians will be used to characterize the study variables.

3.2 Design and data sources

This study will analyze a cross-sectional data from the Public Use Microdata File (PUMF) of the 2018 National Graduates Survey (NGS) which follows the 2015 cohort of graduates three years after graduation (Statistics Canada, 2019). The NGS provides some insight into graduates' occupational outcomes after graduation. The target population of the 2018 NGS includes graduates living in Canada who completed their program sometime in 2015 from a recognized postsecondary Canadian institution. Data is collected online by respondent self-completion as well as a computer-assisted telephone interview method. There is a total of 19,564 respondents in the 2018 NGS PUMF. However, the survey weights will be incorporated into all the analysis in this study for the estimates produced from the survey data to be representative of the target population and not just the sample. Overall response rate for the survey is 63%.

The survey, which used a stratified simple random sample design, sampled graduates from postsecondary education institutions (such as universities, colleges, and trade schools) in Canada who graduated with degree, diploma or certificates sometime in 2015. The survey used two variables for the stratification: geographical locations of the

postsecondary education institutions and the level of certification (college, undergraduate, master's and doctorate). Selection of graduates into each category was done without replacement.

The survey excludes graduates from private postsecondary institutions, graduates who completed continuing-education programs at colleges and universities unless it led to a diploma or degree, graduates in apprenticeship programs and graduates living outside of Canada and the US at the time of the survey. Unfortunately, the survey did not make adjustment for this under-coverage at the weighting stage.

3.3 Variable Definitions

Gross annual earnings in Canadian dollars

The dependent variable for this study is the gross annual earnings in Canadian dollars. This study will focus on annual before-tax earnings of graduates in order to eliminate the effects of tax transfer programs and tax credits that affect the after-tax earnings of some graduates. Graduates who held a job in the week prior to the interview were asked to report their estimated gross annual earnings in Canadian dollars for the job held during the 2018 survey reference week. These annual earnings are total personal income from all sources. Other sources of income besides labour market income may be included here.

Overall grade average

The key independent variable will be the graduate's overall grade average. One major challenge in this study is the scarcity of data on graduates' cumulative grade point

average (GPA). Unlike previous waves of the NGS, the 2018 data is the first PUMF which contains explicit information on the final grades obtained in postsecondary education programs in Canada. Grades will be measured using graduate's overall grade average in their respective fields of study. Respondent's answers on their overall grade average at the time of graduation are grouped into three categories: 1) A, A, A-, 2) B+, B, B-, and 3) C+, C, C-, D+, D, D-, where A+, A, A- is the highest overall grade average category and C+, C, C-, D+, D, D- is the lowest overall grade average category. For the purpose of this study, the A+, A, A- category, B+, B, B- category, and the C+, C, C-, D+, D, D- category will be referred to as A-range, B-range and C or D-range overall grade average respectively. This variable is an indicator variable and respondents with a C or D-range overall grade average are the reference group.

Demographic characteristics

Demographic characteristics to be examined in this study includes age at graduation, gender, marital status, and parents' level of education. All these demographic variables will be treated as covariates. Gender in the 2018 NGS is a categorical variable which is measured as either male or female. Gender will be used as a control variable in this study with females as the reference group. In addition, age at time of graduation is also a categorical variable with four categories: less than 25, 25 to 29, 30 to 39, and 40 or more. Individuals aged less than 25 at the time of graduation are the reference group for all empirical analysis in this study.

About 8,887 out of the 19,564 respondents, or about half the sample, were married at the time of the 2018 NGS.. Therefore, marital status is included in this study as a

covariate. Marital status is grouped into two categories; married or living common-law and single/ widowed/ separated/ divorced. Individuals who are either single, divorced, separated or widowed will be the reference group in all the empirical analysis in this study.

Lastly, the education levels of both parents at the time of the survey interview will be used to represent parent's education level. Both variables have six categories: less than a high school diploma or its equivalent, high school diploma or a high school equivalency certificate, trade certificate or diploma, college/CEGEP/other non-university certificate or diploma, university below bachelor's/bachelor's, and university above bachelor's/ master's/doctorate. The last category, university above bachelor's/master's/doctorate, includes post-bachelor's degree certificates or diplomas. Mother and father's education level will be treated as covariates. Both the Kendall's tau_b and the Spearman's rho correlation coefficients indicate a moderate correlation between mother's and father's education level (0.456 and 0.542, respectively) and hence both variables can be included in the estimation models. Both parents' education levels are dummy variables with respondents whose parents' highest education levels are less than a high school diploma or its equivalent as the reference group.

Field of study

Field of study categories in the 2018 NGS is based on Statistics Canada's 2016 Classification of Instructional Programs (CIP 2016). There are ten field of study categories in the PUMF: 1) education, 2) visual and performing arts, and communications technologies, 3) humanities, 4) social and behavioural sciences and law, 5) business, management and public administration, 6) physical and life sciences and technologies,

7)mathematics, computer and information sciences, 8)architecture, engineering and related technologies, 9) health, parks, recreation and fitness, and 10) other (includes agriculture, natural resources and conservation; personal, protective and transportation services).

Work experience during enrollment

This variable is measured by asking respondents whether they ever worked at a job or business while they were enrolled in their 2015 program. The responses are yes/no, with "yes" indicating that the graduate worked during enrollment and "no" representing otherwise. Respondents in the "no" category are the reference group.

Other education or training since graduation

For this variable, participants were asked if they had taken any other program at a postsecondary educational institution towards a certificate, diploma, or degree since graduation in 2015. This variable also has a yes/no response. Respondents in the "no" category will be the reference group for all empirical analysis in this study.

Highest level of education before enrollment

To control for the possibility of other factors that are likely to influence an individual's grades, a variable on respondents' highest level of education completed before enrollment in 2015 program will be included in the empirical analysis for this study. Participants were asked to report their highest level of education prior to enrollment. This variable has four categories; college (i.e., CEGEP certificate or diploma, college or other non-university certificate or diploma), bachelor's (i.e., bachelor's degree including degree in medicine, dentistry, veterinary medicine or optometry), master's/doctorate degree and

other (i.e., any other level of education besides the college, bachelor's and master's/doctorate).

Level of study

This variable represents respondents' level of study during their 2015 program. It is a categorical variable with three levels; college, bachelor's, and master's or doctorate. Individuals with a college diploma or certificate will be the reference group for all empirical analysis in this study.

3.4 Sample restrictions

I impose some sample restrictions on the dataset in order to reduce errors in the data analysis. I recode marital status, gender, highest level of education before enrollment, age at graduation, work experience during enrollment, level of study and other education or training since graduation into a set of dummy variables. For marital status, the dummy variable is equal to one for married or living common-law and zero for either single, widowed, separated, or divorced. Similarly, the dummy variables for gender is equal to one for males and zero for females.

Regarding work experience during enrollment with a yes/no response, I let one represent a yes and zero represent a no. I also recode age at graduation, which has four categories, into three dummy variables. Thus, 25 to 29 = 1, 30 to 39 = 1, 40 or more = 1, and zero otherwise (less than 25 years). In the same way, highest level of education before enrollment is recoded into a set of dummies; College = 1, Bachelor's = 1, Master's/ Doctorate = 1, and 0 otherwise (Other). Regarding level of study, dummy variables equals

one for bachelor's, one for master's or doctorate and zero for college. Finally, for other education or training since graduation, one represents individuals who have obtained other education or training since graduation and zero represent individuals with no other education or training since graduation.

3.5 Estimation method

This study will use Mincer's (1974) human capital earnings function method to model the relationship between earnings and grades. In its first application, Mincer regressed the natural logarithm of earnings on years of education and years of labour market experience (Mincer, 1974). Since then the method has been widely used in the labour economics literature to measure gains from education using a variety of linear regression models (Chia &Miller, 2008; Finnie et al., 2016).

An ordinary least square (OLS) regression method will be used to model the grade-earning relationship. The OLS model will be estimated with robust standard errors to control for possible heteroskedasticity. First, a baseline model is used to assess the relationship between log transformation of annual earnings and overall grade average, without controlling for covariates as shown below.

$$\ln(\text{earnings})_i = \alpha + \beta G_i + \mu_i \qquad (1)$$

where $\ln(\text{earning})_i$ represents the natural logarithm of gross annual earnings in Canadian dollars for individual i. α represents the constant term. G_i is an indicator variable for overall grade average. It is a vector of the top two overall grade average dummy variables which are the explanatory variables; A-range and B-range. Individuals in the last grade group, C or D-range, are the reference group. β represents a vector of coefficients for the top two

grade average dummy variables to be estimated. It shows approximations of percentage differences in the earnings of individuals in the top two overall grade average groups compared to that of respondents in the reference group, C or D-range grade average. μ_i is a random error term which is assumed to be normally distributed and independent of all the explanatory variables.

In order to answer the first research question of this study as stated in Chapter One, a second model is estimated where the log of gross annual earnings is regressed on grades, while controlling for the effect of graduates work experience during enrollment, level of study and personal demographic characteristics including age at graduation, marital status, and gender. Thus, the structural equation is model 2 below

$$\ln (\text{earnings})_i = \alpha + \beta G_i + \gamma X_i + \lambda EXP_i + \mu_i \qquad (2)$$

where $\ln (\text{earnings})_i$ shows the natural logarithm of gross annual earnings in Canadian dollars for individual i. The components of G_i are the same as mentioned above. X_i denotes a vector of personal demographic and school characteristics including age at time of graduation, gender, marital status, level of study, which are dummy variables. γ represents a vector of their coefficients to be estimated. EXP_i is a dummy variable which represents individual i's work experience during enrollment and λ is its coefficient to be estimated. μ_i is the error term assumed to be independent of all the explanatory variables and to be normally distributed. However, model 2 above cannot be used to consistently estimate β. This is because, overall grade average may be causally related to an individual's unobserved innate ability. In that case, G_i in model 2 will be correlated with the error term μ_i. G_i will therefore become endogenous and the estimates of β will be biased. In order to correct this possible endogeneity problem, it is important to obtain consistent estimates of

β. I do this by employing the two-stage regression procedure where I estimate the reduced form model below in the first stage:

$$G_i^* = \pi Z_i + + \eta X_i + \Omega EXP_i + v_i \qquad (3)$$

where X_i and EXP_i are same as already defined and η and Ω are their respective reduced form coefficients to be estimated. Since G_i^* is an ordinal dependent variable, model 3 above will be estimated using an ordered probit regression method. As discussed in the previous chapter, mother's education, father's education, and highest level of education before enrollment in their postsecondary education can affect the grades they obtain and hence these three variables will be used as instruments for overall grade average (G_i) in the reduced form model above. Z_i in model 3 is therefore a vector of instrumental variables for G_i which consists of an individual's mother's education, father's education, and highest level of education before enrollment. π is a vector of their respective coefficients to be estimated. v_i is the reduced form error term assumed to be independent of Z_i and normally distributed. As previously stated, G_i takes on three categorical values. G_i^* in model 3 is an unobserved latent variable which corresponds to an individual's overall grade average, that is linked to the observed ordinal variable G_i by the measurement below

$G_i =$ 1 if $G_i^* \leq \delta_1$ (A-range)

2 if $\delta_1 < G_i^* \leq \delta_2$ (B-range)

3 if $\delta_2 \leq G_i^*$ (C or D-range)

The δs are threshold parameters (cut-off points between successive alternatives) to be estimated along with π. The probability that G_i takes on the values 1, 2 and 3 are

Prob (G_i =1) = ϕ ($\delta_1 - \pi Z_i$)

Prob (G_i =2) = ϕ ($\delta_2 - \pi Z_i$) - ($\delta_1 - \pi Z_i$)

Prob (G_i =3) = 1 - ϕ ($\delta_2 - \pi Z_i$)

where ϕ is the cumulative function of a normal distribution. Model 3 will be estimated using robust standard errors. The predicted probabilities from this model will be obtained.

For the second stage, the log transformation of gross annual earnings will be regressed on overall grade average, gender, age at graduation, level of study, marital status, work experience during enrollment, and the predicted probabilities obtained from the ordered probit model (model 3). This is shown in model 4 below and it will be estimated using the ordinary least square (OLS) method with robust standard errors. By controlling for the predicted values in model 4, OLS can now be used to consistently estimate β.

$$\ln (\text{earnings})_i = \alpha + \beta G_i + \gamma X_i + \lambda EXP_i + \rho \hat{v}_i + \varepsilon_i \qquad (4)$$

where $\mu_i = \rho v_i + \varepsilon_i$

Here, α, β, G_i , γ, X_i , λ, and EXP_i are same as already defined. $\hat{v}_i$ represents the predicted probabilities obtained from the ordered probit model and ρ denotes its coefficient to be estimated. Here, we test the hypothesis that ρ is statistically insignificant using the t-statistic. Thus, we test H_0: ρ=0. If ρ is statistically insignificant, then G_i is exogenous. However, if ρ is statistically significant, it would imply that G_i is endogenous and hence OLS can only be used to consistently estimate β if we estimate model 4.

The relationship between grades and log of earnings will be estimated separately by subsamples. First, model 4 will be estimated separately for college diploma holders, bachelor's degree holders and master's or doctorate degree holders. Next, we disaggregate regressions based on model 4 by field of study. Model 4 will also be estimated separately

by field of study and level of study. In the same way, we estimate model 4 separately for males, females, samples who worked during enrollment and samples who did not work during enrollment. Finally, we estimate model 4 separately for respondents who have acquired other education or training since graduation and graduates who have not obtained any other education or training since graduation in order to answer the research questions of this thesis[1].

3.6 Descriptive statistics

Table 3.1 below shows details of the summary statistics for all the variables; the number of observations (N), mean, and median. Results from Table 3.1 below indicate that the average gross annual earning in Canadian dollars for the 2015 cohort is $51,499. Median earning is $45,000. Majority of the respondents graduate with an A-range overall grade average (45.4%), are either single, divorced, widowed, or separated (59.4%), have qualifications in business, management, and public administration (22.2%), have mothers and fathers who have a bachelor's degree (26.9% and 25% respectively), aged less than 25 (55.6%), and have a bachelor's degree (48.5%). Also, the number of respondents who worked during enrollment are more than respondents who did not work during enrollment (73.1% and 26.9%, respectively). Regarding gender, about 58.5% of the respondents are females whereas males are about 41.5% of the entire sample. Most of the respondents have not obtained any other education or training since graduation (60.2%). Finally, majority

[1] A specification which adds the interaction terms as regressors to the models will also be estimated separately for each subsample (interaction of overall grade average and each moderating variable) to see how the empirical results change compared to the disaggregated regressions. Results based on this specification will be presented in Appendix A.

of the respondents had a bachelor's degree before enrollment in their 2015 program (50.9%).

Table 3.1: Summary statistics

Variable	Weighted frequency	Valid %	Mean	Median
Gross annual earnings	323,684	100	$51,499	$45,000
Overall grade average				
A-range	190,736	45.4		
B-range	187,939	44.8		
C or D-range	28,005	6.7		
Marital status				
Married or living common-law	171,286	40.6		
Single/separated/widowed/divorced	250,888	59.4		
Field of study				
Education	29,150	6.9		
Visual and performing arts, and communications	18,227	4.3		
Humanities	20,000	4.7		
Social and behavioral sciences and law	71,062	16.8		
Business, management and public administration	94,227	22.2		
Physical and life sciences and technologies	23,758	5.6		
Mathematics, computer and information sciences	16,160	3.8		

Architecture, engineering and related technologies	58,903	13.9
Health, parks, recreation and fitness	66,112	15.6
Other	26,563	6.3
Mother's education		
Less than a high school diploma or its equivalent	38,709	9.7
High school diploma or a high school equivalency certificate	96,682	24.2
Trade certificate or diploma	25,562	6.4
College, CEGEP or other non-university certificate or diploma	83,768	21.0
University below Bachelor's/ Bachelor's	107,495	26.9
University above Bachelor's/ Master's/ Doctorate	47,189	11.8
Father's education		
Less than a high school diploma or its equivalent	45,354	11.6
High school diploma or a high school equivalency certificate	81,913	21.0
Trade certificate or diploma	42,405	10.9
College, CEGEP or other non-university certificate or diploma	59,135	15.1
University below Bachelor's/ Bachelor's	97,775	25.0

University above Bachelor's/ Master's/ Doctorate	64,038	16.4
Age		
Less than 25	235,800	55.6
25 to 29	90,819	21.4
30 to 39	60,835	14.4
40 or more	36,333	8.6
Level of study		
College	148,145	35.2
Bachelor's	203,771	48.5
Master's or Doctorate	68,456	16.3
Work experience during enrollment		
Yes	309,896	73.1
No	113,826	26.9
Gender		
Male	176,226	41.5
Female	248,227	58.5
Other education or training since graduation		
Yes	168,786	39.8
No	255,244	60.2

Highest level of education before enrollment		
Other	7185	3.8
College	64,089	33.8
Bachelor's	96,520	50.9
Master's/ Doctorate	21,970	11.6

Source: Researcher's calculations based on data from NGS 2018. The valid % presents the percentage of only the non-missing cases falling into each category.

Table 3.2 below shows the average earnings for each moderating variable. Individuals who graduate with an A-range overall grade average receive an average gross annual income of $54,664 and individuals who graduate with a B-range receive average annual income of $49,544. Average gross annual earnings for respondents with either a C or D-range overall grade average is $44,993. Overall, individuals who graduate with an A-range grade average have the highest average gross annual earnings.

Table 3.2: Group comparisons by average gross annual earnings

Variables	**Average Earning ($)**
Overall grade average	
A-range	54,664
B-range	49,544
C and D-range	44,993
Field of study	
Education	55,459
Visual and performing arts, and communications technologies	37,857
Humanities	42,599
Social and behavioral sciences and law	46,173
Business, management and public administration	54,141
Physical and life sciences and technologies	48,352
Mathematics, computer and information sciences	
Architecture, engineering and related technologies	58,322
Health, parks, recreation and fitness	57,297
Other	53,721
	45,112
Other education or training since graduation	
Yes	45,841
No	54,781
Gender	

Male	55,383
Female	48,770
Level of study	
College	43,076
Bachelor's	52,565
Master's or Doctorate	67,003
Work experience during enrollment	
Yes	52,002
No	49,976

Source: Researcher's calculations based on data from 2018 NGS

Results in Table 3.2 also show that graduates with postsecondary education qualification in mathematics, computer and information sciences have the highest average gross annual income, $58,322. This is followed by respondents with academic credentials in architecture, engineering and related technologies sciences ($57,297), education ($55,459), business, management and public administration ($54,141), health, parks, recreation and fitness ($53,721), physical and life sciences and technologies ($48,352), social and behavioral sciences and law ($46,173), other ($45,112), humanities ($42,599), and visual and performing arts, and communications technologies ($37,857) .

Furthermore, graduates who worked during enrollment have average annual earnings of $52,002 which is more than the $49,976 that individuals who did not work during enrollment receive on average. Master's or doctorate degree holders have the highest average annual earnings, $67,003. Also, individuals who have acquired other education or training since graduation have a lower average annual income ($45,841)

compared to their counterparts who have not acquired any other education or training since graduation ($54,781). Finally, regarding gender, males have higher average gross annual earnings than females ($55,3832 and $48,770, respectively).

Table 3.3: Distribution of overall grade average across field of study

Field of study	**Frequency (%)**		
	A-range	**B-range**	**C and D-range**
Education	61.7	31.6	6.8
Visual and performing arts, and communications technologies	47.0	46.5	6.5
Humanities	46.5	43.8	9.7
Social and behavioural sciences and law	43.4	47.7	8.9
Business, management and public administration	40.5	49.2	10.4
Physical and life sciences and technologies	47.9	41.6	10.5
Mathematics, computer and information sciences	45.5	44.6	9.9

Architecture, engineering and related technologies	43.2	45.0	11.8
Health, parks, recreation and fitness	48.4	41.5	10.1
Other	45.4	44.8	9.8

Source: Researcher's calculations based on NGS 2018.

Finally, Table 3.3 above shows the distribution of overall grade average by field of study. Except for respondents with credentials in architecture, engineering, social sciences, behavioural sciences, law, business, management and public administration, the majority of the respondents with credentials in the other seven fields of study categories graduate with an A-range grade average. Thus, about 61.7 percent of respondents with credentials in education have an A-range grade average. This is followed by health, parks, recreation and fitness (48.4 percent), physical and life sciences and technologies (47.9 percent), visual and performing arts, and communications technologies (47 percent), humanities (46.5 percent), mathematics, computer and information sciences (45.5 percent), other fields of study including agriculture, natural resources and conservation (45.4 percent), social and behavioural sciences and law (43.4 percent), architecture, engineering and related technologies (43.2 percent), and business, management and public administration (40.5 percent). The majority of respondents with credentials in business, management and public administration have a B-range overall grade average (49.2 percent). This is followed by social, behavioral sciences and law (47.7 percent) and architecture, engineering and related technologies (45.0 percent). Among all ten field of study categories, respondents with credentials in architecture, engineering and related technologies have the highest number of graduates with a Cor D-range overall grade average (11.8 percent).

Table 3.4: Distribution of overall grade average across level of study

Field of study	**Frequency (%)**		
	A-range	**B-range**	**C and D-range**
College	45.5	43.5	7.0
Bachelor's	37.2	52.4	8.4

Master's/ Doctorate	70.1	25.2	1.0

Source: Researcher's calculations based on NGS 2018.

Results from Table 3.4 above shows that majority of respondents with a college diploma or certificate graduate with an A-range overall grade average (45.5 percent). On the other hand, most respondents with a bachelor's degree or certificate score a B-range overall grade average (i.e., 52.4 percent). About 70.1 percent of respondents with a master's/doctorate degree score an A-range overall grade average. Among all three level of study categories, respondents with a bachelor's degree have the highest number of graduates with a Cor D-range overall grade average (8.4 percent) respondents with a master's/doctorate degree have the lowest number of graduates with a C or D-range overall grade range average (1 percent).

CHAPTER 4

4.1 Empirical results

In this chapter, the least square regression results based on the models discussed in Chapter Three are presented and discussed to assess the relationship between overall grade average and labour market earnings. Results in this chapter are based on cross-sectional data from Statistics Canada's 2018 National Graduates Survey (NGS). The relationship between grade and earnings may vary by field of study, level of study, labour market experience before graduation, other education or training since graduation, and gender as indicated by the descriptive analysis. To account for these differences, coefficient estimates are analyzed separately by field of study, level of study, labour market experience before graduation, other education or training after graduation, and gender.

4.2 Regression results on the grade-earning relationship

The estimated results on the relationship between overall grade average and annual labour market earnings based on the models discussed in Chapter Three are presented and discussed in this section. The key coefficient is β, which represents log earning differences among the three grade groups. Thus, approximations of percentage differences in the earnings of the top two grade groups compared to the earnings of respondents in the reference group, C or D-range overall grade average[2]. The second column of Table 4.1 shows the OLS estimates from the baseline model (model 1) which does not control for

[2] Coefficient estimates presented here are only approximations of the marginal effects. Thus, because the grade dummies are binary variables and the dependent variable is in log form, the more accurate estimate can be obtained by using the formula: marginal effect = $100.[e^{(\beta)} - 1]$, where e is the mathematical constant 2.71828127.

covariates. The β estimates for respondents in each grade group are positive and statistically significant at the five percent significance level. Individuals with an A-range overall grade average earn on average approximately 17.78 percent more than their counterparts with either a C or D-range overall grade average, and graduates with a B-range grade average earn about 9.24 percent more. This positive relationship between overall grade average and labour market earnings is consistent with both the signalling/screening hypothesis and human capital theory. However, model 1 omits observable variables (Xi) and unobservable variables that affects both grades and labour market earnings and this leads OLS to misestimate the relationship between academic ranking and earnings.

The overall grade average variable (G_i) in model 1 may be correlated with the error term which will in that case make G_i endogenous. For this reason, we adopt the two-stage regression procedure already discussed in Chapter Three to correct for this possible endogeneity problem. Results from the first stage ordered probit model (model 3) are presented in Appendix B (Table B.1). The sixth column of Table 4.1 below shows the OLS results from the second stage of the two-stage regression procedure (model 4) when age at graduation, gender, marital status, level of study, work experience during enrollment, and the predicted probabilities obtained from the ordered probit model are controlled for. The coefficient of the predicted probabilities obtained from the probit model is statistically significant at the five percent level. This implies that overall grade average (G_i) is indeed endogenous and hence OLS can only consistently estimate β if we estimate model 4.

Other characteristics affect labour market earnings. Results based on model 4 show that respondents with a bachelor's and a graduate degree (master's or doctorate) earn on

average 24.67 percent and 29.58 percent more respectively than respondents with a college diploma or certificate. Graduates who worked during enrollment earn approximately 3.12 percent more than graduates who did not work during enrollment in their postsecondary education and this result is significant at the five percent level.[3] In addition, males earn on average about 19.19 percent more than females. Also, individuals who are either married or living common law earn on average 9.82 percent more than individuals who are either single, divorced, separated, or widowed. Furthermore, the relationship between age of respondent at the time of graduation and earnings is positive and significant with individuals aged 25 and above earning more than individuals aged less than 25 years. Since there is generally a positive and significant relationship between gender, age of respondent at graduation, level of study, marital status, and labour market experience during enrollment on one hand, and labour market earnings on the other, regression results that omit these variables will have biased coefficient estimates.

The OLS parameter estimates from model 4 show that when the effects of graduates' individual differences are controlled for, the coefficient estimates for respondents with an overall grade average in the A and B-range remain statistically significant at the five percent level. Respondents with an A and B-range overall grade average earn approximately 9.84 percent and 6.25 percent more respectively than their counterparts with a C or D-range grade average. The coefficient estimates for both grade groups have become smaller, and this result is robust to endogeneity correction. Based on results from model 4, one can say that even in the presence of graduates' individual

[3] The work experience during enrollment variable in the PUMF of the 2018 NGS is measured with a question that asks respondent if they worked in any job or business during their 2015 program and has a yes or no response. As a result, it is impossible to disentangle work experience during enrollment in (say) a co-op program from other part-time or full-time work.

differences, overall grade average has a direct positive effect on labour market earnings. Inclusion of the covariates does not take away the effect that overall grade average has on labour market earnings for these student groups. Hence age at graduation, level of study, gender, marital status, and labour market experience during enrollment does not confound the qualitative relationship that exists between overall grade average and labour market earnings.

To conclude, the results reveal that a positive significant relationship exists between overall grade average and labour market earnings. The gross annual earning of respondents with an A and B-range grade average is greater than that of respondents with a grade average in the C or D-ranges. Hence, higher grades are important as they do translate into higher labour market earnings. This result supports both the signalling/screening hypothesis and human capital theory. However, since the empirical results from this study is based on data from the PUMF of the 2018 NGS which surveyed the 2015 cohort three years after graduation, the positive relationship reflects more of the signalling effects of grades compared to the human capital effects of grades. Thus, grades are a strong signal of an individual's potential to excel in the labour market and hence individuals with an A and B-range overall grade average will get job interviews into higher paying job positions faster than individuals who have a relatively lower grade average. This positive relationship between overall grade average and earnings is also consistent with the findings of Gemus (2010) and Kuncel et al. (2004).

Table 4.1: Key parameter estimates on the grade-earning relationship

Variables	**Model 1 (Baseline model)**	**Model 4 (Second-stage regression)**

Overall grade average (Reference group: respondents with a C or D-range overall grade average)		
A-range	0.1778***	0.0984***
	(0.0225)	(0.0223)
B-range	0.0924***	0.0625***
	(0.0224)	(0.0213)
Constant (α)	10.6065***	10.1003***
	(0.0207)	(0.0509)
Controls for predicted probabilities (from ordered probit model)		0.4548***
		(0.1094)
Controls for gender (Reference group: female)		
Male		0.1919***
		(0.0121)
Controls for marital status (Reference group: single/ separated/ divorced/ widowed)		0.0982***
Married or living common-law		(0.0120)
Controls for age at graduation (Reference group: less than 25)		
25 to 29		0.0910***
		(0.0132)
30 to 39		0.0978***
		(0.0169)
40 or more		0.1032***
		(0.0202)
Controls for level of study (Reference group: college diploma /certificate)		
Bachelor's		0.2467***
		(0.0137)
Master's / Doctorate		0.2958***
		(0.0256)
Controls for Work experience during enrollment (Reference group: No)		
Yes		0.0312**
		(0.0127)
R^2	0.0095	0.1391
Number of observations	15,063	15,063

Notes: Robust standard errors in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Results based on model 2, first-stage ordered probit regression, are presented in Table B.1 in Appendix B.

4.3 Variations in the grade-earnings relationship

In the results above we have assumed that overall grade average does not vary by respondent's observable characteristics. However, as studies by Finnie et al. (2016) and Chia & Miller (2008) have shown, grades are more important in predicting earnings for some individuals but not for others. It is worthwhile to examine whether the relationship between overall grade average and labour market earnings vary by respondent's gender, field of study, level of study, work experience during enrollment, and other education or training after graduation. Since we have established in the previous section that overall grade average is indeed endogenous, the OLS coefficients are estimated separately for these subsamples based on model 4 in the sections below in order to obtain unbiased OLS coefficient estimates.

Analysis by level of study

In this section, we run separate regressions for respondents with a college diploma, bachelor's degree and master's or doctorate degree (i.e., graduate degree). The coefficient estimates based on model 4 are presented in Table 4.2 below. Concerning college diploma holders, the β estimates are statistically significant at the five percent only for those with an A-range overall grade average. They earn approximately 9.98 percent more than their counterparts with college diploma who score a C or D-range overall grade average. Therefore, graduating with an A-range overall grade average translates into higher labour market earnings among college graduates.

There are some significant differences in the grade-earnings relationship among bachelor's degree holders. Compared to the earnings of bachelor's degree holders with a

C or D-range overall grade average, scoring an A or B-range grade average is associated with higher earnings. Bachelor's degree holders who graduate with an A and B-range overall grade average earn approximately 8.08 percent and 9.50 percent more, respectively, than bachelor's degree holders with a C or D-range overall grade average. Among respondents with a graduate degree, those with an A-range and B-range overall grade average earn about 36.04 percent and 30.56 percent more, respectively, than their counterparts with a C or D-range overall grade average.

The results above reveal that the grade-earnings relationship does vary by level of study. Obtaining a higher grade at the graduate or bachelor's level enhances individual's earnings more than obtaining higher grades at the college level[4]. The coefficient estimates are larger for graduate degree holders than they are for college and bachelor's degree holders. Descriptive statistics in Table 3.4 from the previous chapter has shown there is little variation in grades among respondents with a graduate degree and this could be why coefficient estimates a bigger for this student group. About 70.1 percent and 25.2 percent of respondents with a graduate degree score an A-range and B-range grade average, respectively, compared to only one percent with a C or D-range grade average. Thus, those graduate students with an A and B-range overall grade average are not being rewarded so much as those with a C or D-range grade average are being penalized.

[4] When we add the interaction of overall grade average and level of study to model 4, we find that there is a significant interaction effect between overall grade average and level of study. This further proves that the relationship between grades and earnings does depend on level of study. Results based on this specification are presented in Table A.1 in Appendix A.

Table 4.2: Key parameter estimates by level of study

Variable	Model 4	Model 4	Model 4
Overall grade average	**College** (Reference group: college diploma holders who graduate with a C or D-range grade average)	**Bachelor's** (Reference group: bachelor's degree holders who graduate with a C or D-range grade average)	**Master's or Doctorate** (Reference group: master's/ doctorate degree holders with a C or D-range grade average)
A-range	0.0998***	0.0808***	0.3604**
	(0.0342)	(0.0310)	(0.1496)
B-range	0.0001	0.0950***	0.3056**
	(0.0334)	(0.0286)	(0.1506)
Constant	10.1254***	10.4738***	0.2994***
	(0.0628)	(0.0731)	(0.1907)
Predicted probability	0.3188*	0.2079	0.3047**
	(0.1233)	(0.1956)	(0.1562)
Marital status (Reference group: single/ separated/ divorced/ widowed)			
Married or common-law	0.1123***	0.1245***	0.0542***
	(0.0201)	(0.0188)	(0.0209)
Age at graduation (Reference group: less than 25)			
20 to 29	0.0824***	0.1245***	0.0119
	(0.0258)	(0.0212)	(0.0260)
30 to 39	0.0958***	0.0893***	0.1167***
	(0.0299)	(0.0297)	(0.0259)
40 or more	0.0516	0.0999**	0.1963***
	(0.0342)	(0.0407)	(0.0285)

Work experience during enrollment (Reference group: No)			
Yes	0.0704*	-0.0167	0.0539***
	(0.0213)	(0.0232)	(0.0205)
Gender	0.2646***	0.1471***	0.0767***
	(0.0199)	(0.0170)	(0.0178)
R^2	0.0917	0.0523	0.0548
Number of observations	4,695	6,436	3,932

Notes: Robust standard errors in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. All other control variables in model 4, i.e., age, gender, predicted probability, marital status and work experience during enrollment are controlled for in this regression. First-stage ordered probit results available on request.

Analysis by field of study

Here we disaggregate the regressions based on model 4 by field of study[5]. OLS results for each subsample based on model 4 which controls for demographic characteristics, level of study and work experience during enrollment are presented in Table 4.3 below. Table 4.3 provides evidence of heterogeneity in the relationship between overall grade average and labour market earnings across different fields of study. Individuals who scored either a C or D-range overall grade average in each field of study category are the reference group.

Beginning with respondents with academic credentials in education, the coefficient estimates for both grade groups are statistically insignificant at the five percent level. Hence, grades do not predict the earnings of respondents with credentials in education. In the same way, there are no significant earning differences among the grade groups for respondents with credentials in visual, performing arts, communications technologies and humanities. For respondents with credentials in social and behavioural sciences, and law, only the coefficient estimate for only those with a B-range grade average is statistically significant at the five percent level. They earn approximately 11.26 percent more than their colleagues with same qualification with a C or D-range grade average.

[5] Since we are estimating model 4 separately for each field of study category, the sample size in each regression is restricted to only respondents in that group. For instance, when we estimate model 4 for respondents with credentials in humanities, the sample size reduces to only respondents with credentials in humanities.

Table 4.3: Grade-earning relationship by field of study

Field of study	**Overall grade average** (**Reference group: C or D-range grade average)**	**Model 4**
Education	A-range	0.1857
		(0.2196)
	B-range	0.1803
		(0.2157)
	Worked during enrollment	0.0359
		(0.0492)
	Number of observations	1,234
	R^2	0.2382
Visual and performing arts and communications technologies	A-range	0.2266
		(0.1470)
	B-range	0.2699*
		(0.1409)
	Worked during enrollment	-0.0664
		(0.0984)
	Number of observations	480

	R^2	0.0932
Humanities	A-range	0.0316
		(0.1199)
	B-range	0.0153
		(0.1175)
	Worked during enrollment	0.0452
		(0.0860)
	Number of observations	579
	R^2	0.1174
Social and behavioural sciences and law	A-range	0.0921*
		(0.0503)
	B-range	0.1126**
		(0.0479)
	Worked during enrollment	0.0436
		(0.0376)
	Number of observations	2,234
	R^2	0.1265
Business, management, and public administration	A-range	0.1784***
		(0.0409)
	B-range	0.0514

		(0.0392)
	Worked during enrollment	0.1365***
		(0.0232)
	Number of observations	3,465
	R^2	0.2384
Physical and life sciences and technologies	A-range	-0.0886
		(0.0932)
	B-range	0.0416
		(0.0789)
	Worked during enrollment	0.0444
		(0.0547)
	Number of observations	816
	R^2	0.1068
Mathematics, computer and information sciences	A-range	0.1655**
		(0.0719)
	B-range	0.0244
		(0.0722)
	Worked during enrollment	0.0039
		(0.0503)
	Number of observations	606

	R^2	0.2024
Architecture, engineering and related technologies	A-range	0.1477***
		(0.0431)
	B-range	0.0588
		(0.0430)
	Worked during enrollment	0.0434*
		(0.0255)
	Number of observations	2,049
	R^2	0.1355
Health, parks, recreation and fitness	A-range	0.0291
		(0.0612)
	B-range	0.0269
		(0.0601)
	Worked during enrollment	0.0241
		(0.0289)
	Number of observations	2,709
	R^2	0.1770
Other (Agriculture, natural resources and conservation; Personal, protective and transportation services)	A-range	0.1360*
		(0.0718)
	B-range	0.0685

	(0.0726)
Worked during enrollment	0.1336***
	(0.0506)
Number of observations	891
R^2	0.1305

Notes: Robust standard errors in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Control variables in these regressions include age, gender, predicted probability, marital status, work experience during enrollment and level of study. First-stage ordered probit results and full OLS results available on request.

Compared to respondents with a C or D-range grade average, scoring an A-range overall grade average is associated with higher labour market earnings for respondents with qualifications in business, management and public administration. Only the coefficient estimate for respondents in this student group with an A-range grade average is statistically significant at the five percent level. Respondents with qualifications in business, management and public administration who graduate with an A-range overall grade average earn about 17.84 percent more percent more than their counterparts with a C or D-range overall grade average. This positive grade earning relationship among respondents in this student group with an A-range overall grade average corroborates the findings of Finnie et al. (2016). The coefficient for work experience during enrollment is also positive and significant for this student group indicating that their work experience is as important as their overall grade average.

The OLS parameter estimates for both grade groups are statistically insignificant for respondents with postsecondary qualifications in physical, life sciences and related technologies. For graduates with credentials in mathematics, computer and information science, the results show a positive significant relationship between overall grade average and labour market earnings for only those with an A-range overall grade average. The coefficient is statistically significant at the five percent level. The earning gap between respondents in this student group with an A-range and C or D-range overall grade average is approximately 16.55 percent. This positive grade earning relationship among respondents in this student group with an A-range overall grade average also corroborates the findings of Finnie et al. (2016).

Similarly, the coefficient estimates are positive and statistically significant for only respondents with postsecondary education credentials in architecture, engineering and related technologies who score an A-range overall grade average. Graduates with credentials in architecture, engineering and related technologies with an A-range overall grade average earn approximately 14.77 percent more than their counterparts with same credentials with a C or D-range overall grade average. This implies that for this student group, a higher overall grade average is important as it does translate into higher earnings.

The OLS parameter estimates for both grade groups are statistically insignificant at the five percent level for respondents with postsecondary qualifications in health, parks, recreation and fitness, agriculture, natural resources, conservation, personal, protective, and transportation services. The coefficient for work experience during enrollment is positive and statistically significant for respondents with academic credentials in agriculture, natural resources, conservation, personal, protective, and transportation services. This implies that work experience is more important in predicting the earnings of respondents with credentials in agriculture, natural resources, conservation, personal, protective, and transportation services.

Overall, the OLS regression results after controlling for the effect of demographic characteristics, level of study and work experience during enrollment provides evidence of heterogeneity in the relationship between overall grade average and labour market earnings across the different fields of study. The regression results indicate that when we account for graduates' individual differences, overall grade average predicts earnings for only respondents with academic credentials in business, management, public administration,

social and behavioural sciences, law, mathematics, computer and information science, architecture, engineering and related technologies[6].

Analysis by field of study and level of study

The previous section has shown that the grade-earnings relationship varies by field of study. It is therefore worthwhile to examine how the relationship changes when we estimate separate regressions by field of study and level of study. There are three levels of study; college, bachelor's, and master's or doctorate degree, and ten field of study categories as already discussed in the previous chapter. Table 4.4 below presents the key coefficient estimates based on model 4.

Starting with respondents with college diploma in education, the grade coefficients are statistically insignificant. This result is similar for respondents with bachelor's degree in education. For respondents with either a master's or doctorate degree in education, only the annual earnings of those with an A-range overall grade average is significantly different from that of their counterparts with a C or D-range grade average with approximately a 32.27 percent difference. Regarding visual and performing arts and communication technologies graduates, only the coefficient for those with a college diploma who score an A-range grade average is statistically significant at the five percent level. Respondents with college diploma in visual, performing arts and communication technologies who score an A-range earn on average 36.42 percent more than their colleagues with a C and D-range

[6] We estimate another specification which adds the interaction of overall grade average and field of study to model 4. Thus, predictors in model 4 now include the interaction of field of study and overall grade average. Coefficient estimates based on this specification are presented in Table A.2 in Appendix A. The results show that none of the field of study and grade average interactions are statistically significant.

grade average. The estimates for β are statistically insignificant for individuals with a college diploma, bachelor's, and a master's or doctorate degree in humanities.

Among graduates with a bachelor's degree in social, behavioural sciences and law, the coefficient estimate is significant at the five percent level for only individuals who score a B-range grade average. They earn approximately 15.04 percent than their counterparts with same level of study who score a C or D-range grade average. For respondents with a graduate degree in social, behavioural sciences and law, the coefficient for both grade groups are statistically significant. Compared to the earnings of respondents with a graduate degree in social, behavioural sciences and law who score a C or D-range overall grade average, graduates with same credentials who score an A and B-range grade average earn about 54.72 percent and 59.85 percent respectively. The coefficient estimate for respondents with credentials in social, behavioural sciences and law is bigger for those with a graduate degree than it is for those with a bachelor's degree. Hence, for social, behavioural sciences and law graduates, obtaining a relatively good grade at the master's or doctorate level increases your chance of earning higher. Again, there is little variation in grades among respondents with a graduate degree. Almost all respondents with a graduate degree score an A or B-range overall grade average.

Compared to the earnings of respondents with a college diploma in business, management and public administration who score a C or D-range grade average, individuals with same credentials who score an A-range grade average earn 14.3 percent more. In addition, graduating with an A-range overall grade average is associated with higher earnings for respondents with a bachelor's degree in business, management and public administration (14.68 percent more). The β estimates for both grade groups are

positive and significant for respondents with a master's or doctorate degree in business, management and public administration. Respondents with a master's or doctorate degree in business, management and public administration who score an A and B-range overall grade average earn about 78.82 percent and 64.25 percent more respectively than their colleagues with a C or D-range overall grade average. There is little variation in grades among respondents with a graduate degree in business, management and public administration and this may explain why the coefficient estimates are bigger for this student group. About 57.6 percent and 39.6 percent of respondents with graduate degree in business, management and public administration have an A and B-range grade average, respectively, compared to only about 1.4 percent of respondents in this student group with a C or D-range grade average. These results suggest that for respondents with academic credentials in business, management and public administration, higher scoring an A-range overall grade average translates into higher earnings at both the college, bachelor's and graduate level.

The estimates for β are statistically insignificant for respondents with either a college diploma, bachelor's degree or graduate degree in physical, life sciences and technologies. In the same way, overall grade average does not predict earnings for both respondents with college diploma, bachelor's degree, and graduate degree in mathematics, computer and information sciences. In contrast, scoring an A-range grade average is associated with higher earnings for respondents with a college diploma in architecture and engineering. They earn 17.60 percent more than their counterparts with a C or D-range grade average. Among respondents with a bachelor's degree in architecture and engineering, the β estimate is significant for only those with an A-range grade average (β

= 0.1318, P = 0.044). Similarly, the earnings of respondents with a graduate degree in architecture and engineering who score an A-range overall grade average is 19.42 percent more than their colleagues with same qualification who score a C or D-range grade average. Again, we see that the coefficient estimate is bigger for respondents with a graduate degree in architecture and engineering than it is for college diploma and bachelor's degree holders, implying that scoring a good grade at the master's or doctorate level is more important in ensuring higher earnings.

The β estimates for respondents with a college diploma in health, parks, recreation and fitness as well as the estimate for respondents with a bachelor's and graduate degree in health, parks, recreation and fitness is statistically insignificant, indicating that overall grade average does not predict earnings for these student groups. Finally, among individuals with credentials in agriculture, natural resources, and conservation, only the coefficient estimate for those with a college diploma who graduate with an A-range grade average is statistically significant. The earnings gap between respondents with a college diploma in agriculture, natural resources, and conservation who score an A-range and C or D-range grade average is approximately 21.56 percent[7].

[7] Specifications which add the interaction of field of study and level of study to model 4 shows a significant interaction effect between field of study and level of study. Results based on this specification are presented in Table A.3 in Appendix A.

Table 4.4 Grade-earning relationship by level of study and field of study

Field of study	**Overall grade average (Reference group: C and D-range grade average)**	**Model 4**		
		Level of study		
		College	**Bachelor's**	**Master's/ Doctorate**
Education	A-range	-0.1175	0.3967	0.3227***
		(0.2178)	(0.2759)	(0.1185)
	B-range	0.0104	0.4218	0.1783
		(0.2619)	(0.2758)	(0.1115)
	Number of observations	167	553	511
	R^2	0.1606	0.0550	0.1492
Visual and performing arts and communications technologies	A-range	0.3642**	0.1393	0.0536
		(0.1633)	(0.2196)	(0.0743)
	B-range	0.2618*	0.3347	0.0493
		(0.1356)	(0.2139)	(0.0742)
	Number of observations	207	212	102
	R^2	0.1148	0.1503	0.0534
Humanities	A-range	-0.4999	0.0567	-0.1325

		(0.2264)	(0.1340)	(0.2066)
	B-range	0.0438	0.0145	0.0147
		(0.2152)	(0.1263)	(0.1811)
	Number of observations	108	381	141
	R^2	0.3653	0.1078	0.0252
Social, behavioural sciences and law	A-range	-0.0515	0.1005*	0.5472**
		(0.1092)	(0.0599)	(0.2838)
	B-range	-0.1107	0.1504***	0.5985**
		(0.1115)	(0.0549)	(0.2889)
	Number of observations	474	1226	509
	R^2	0.0825	0.0768	0.0467
Business, management and public administration	A-range	0.1430**	0.1467***	0.7882***
		(0.0587)	(0.0539)	(0.2049)
	B-range	0.0108	0.0355	0.6425***
		(0.0581)	(0.0502)	(0.2056)
	Number of observations	972	1381	1087
	R^2	0.1142	0.0932	0.1647
Physical, life sciences and technologies	A-range	-0.1864	-0.1075	0.1436
		(0.2374)	(0.1167)	(0.1771)
	B-range	-0.3595	0.1161	0.0596

		(0.2089)	(0.0911)	(0.1748)
	Number of observations	103	440	285
	R^2	0.2730	0.0696	0.48677
Mathematics, computer and information sciences	A-range	0.0448	0.1719	-0.0046
		(0.1236)	(0.1046)	(0.1271)
	B-range	-0.1110	0.0868	-0.1482
		(0.1361)	(0.0872)	(0.1429)
	Number of observations	211	205	188
	R^2	0.2940	0.1209	0.0541
Architecture, engineering and related technologies	A-range	0.1760***	0.1318**	0.1924**
		(0.0614)	(0.0652)	(0.0831)
	B-range	0.0596	0.0801	0.1134
		(0.0631)	(0.0619)	(0.0852)
	Number of observations	985	570	482
	R^2	0.0807	0.0679	0.0837
Health, parks, recreation and fitness	A-range	0.0477	-0.0053	-0.0737
		(0.0990)	(0.0817)	(0.1171)
	B-range	-0.0167	0.0559	-0.0244
		(0.0990)	(0.0769)	(0.1195)
	Number of observations	1088	1061	529

	R^2	0.0430	0.0642	0.0335
Other (Agriculture, natural resources and conservation; Personal, protective and transportation services)	A-range	0.2156**	0.0220	-0.1716
		(0.0888)	(0.1135)	(0.1241)
	B-range	0.1369	-0.0124	-0.2635
		(0.0884)	(0.1097)	(0.1544)
	Number of observations	465	278	142
	R^2	0.1261	0.0505	0.1205

Notes: Robust standard errors in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, predicted probability, marital status and work experience during enrollment. First-stage ordered probit results available on request.

Analysis by gender

In this section, we look at the grade-earnings relationship among male and female graduates based on model 4. The OLS parameter estimates are presented in Table 4.5 below. Starting with male graduates, the parameter estimates for males who score an A and B-range overall grade average are 0.1085 and 0.0594 respectively in model 4. These parameter estimates are statistically significant indicating that higher overall grade average translates into higher earnings among male graduates.

Concerning females, the coefficient estimates for both grade groups are positive and statistically significant at the five percent level. Among females, graduates who score an A-range and B-range grade average earn about 8.92 percent and 6.33 percent more respectively than females who score a C or D-range grade average. This positive significant grade-earnings relationship among male and female graduates is consistent with the findings of Thomas (2000)[8].

Another important point worth mentioning is that the coefficient for work experience during enrollment, although smaller than the grade coefficients, is significant at the five percent level for females whereas it is not for males, indicating that among female graduates, work experience is also important in predicting their earnings.

[8] Table A.4 in Appendix A presents results based on the specification which adds the interaction of gender and overall grade average to model 4. None of the coefficients for the interaction terms are statistically significant, indicating that there are no significant interactions between gender and overall grade average. Thus, no significant differences in the grade-earnings relationship between males and females.

Table 4.5: Key parameter estimates among male and female graduates

Variable	Model 4	Model 4
Overall grade average	**Males** (Reference group: males who graduate with a C or D-range grade average)	**Females** (Reference group: females who graduate with a C or D-range grade average)
A-range	0.1084***	0.0892***
	(0.0317)	(0.0308)
B-range	0.0594**	0.0633**
	(0.0302)	(0.0297)
Constant	10.431***	10.0399***
	(0.0821)	(0.0569)
	0.2429	0.4875***
Predicted probabilities	(0.2060)	(0.1165)
Marital status (Reference group: single/ separated/ divorced/ widowed)		
Married or common-law	0.1320***	0.0856***
	(0.0202)	(0.0149)
Age at graduation (Reference group: less than 25)		
20 to 29	0.0607***	0.1169***
	(0.0200)	(0.0176)
30 to 39	0.0616**	0.1298***
	(0.0303)	(0.0203)
40 or more	0.0561	0.1319***
	(0.0356)	(0.0245)

Level of study (Reference group: college)		
Bachelor's	0.1837***	0.2896***
	(0.0216)	(0.0177)
Master's or Doctorate	0.2374***	0.3715***
	(0.0531)	(0.0299)
Work experience during enrollment (Reference group: No)		
Yes	0.0214	0.0367**
	(0.0180)	(0.0183)
Controls for gender	No	No
R^2	0.1037	0.1412
Number of observations	6,012	9,051

Notes: Robust standard errors in parentheses. * Statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, marital status, predicted probability, level of study and work experience during enrollment. First-stage ordered probit results available on request.

Analysis by work experience during enrollment

Table 4.6 below shows the coefficient estimates for both respondents who worked during enrollment and respondents who did not work during enrollment. For individuals who worked during enrollment, the coefficient estimates are positive and statistically significant at the five percent level for both grade groups. Respondents with an A and B-range overall grade average who worked during enrollment earn about 6.39 percent and 4.66 percent more than their counterparts with a C or D-range overall grade average who also acquired labour market experience during enrollment. Hence, scoring a good grade along with obtaining some work experience before graduation results in higher labour market earnings.

Individuals who obtain some work experience before graduation are more likely to acquire more soft skills, like leadership and interpersonal skills etc., than individuals who do not obtain any work experience before graduation. Therefore, graduates who had some work experience before they graduated and were able to obtain a higher academic grade may earn more than individuals who had work experience before graduation but obtained a lower grade. Their good grades, which reflects higher productivity, coupled the with additional soft skills obtained from previous work experience should give them the upper hand when it comes to job promotion into higher paying job positions over individuals who obtained work experience before graduation but scored a relatively lower grade.

Concerning respondents who did not work while they were enrolled in their program, the coefficient estimates for both grade groups are statistically significant at the five percent level when age at graduation, level of study, gender and marital status are

controlled for in model 4. Respondents who did not work while they were enrolled in their program who scored an A-range and a B-range grade average earn about 20.24 percent and 10.45 percent more than their counterparts who also did not work during enrollment in their program and scored a C or D-range overall grade average. These coefficient estimates are bigger than that of individuals who obtained labour market experience during enrollment. Thus, grades matter more for respondents who acquired no labour market experience during enrollment. Since these graduates did not obtain work experience during enrollment, which provides additional soft skills that also influence earnings, the grades they obtain should matter more[9]. Overall, results reveal that grades are a stronger signal in the absence of work experience. Most graduates have little to no work experience in the first few years after graduation so their grades will be a stronger indicator of their potential to excel in the labour market.

Table 4.6: Grade-earning relationship by work experience during enrollment

Work experience during enrollment	**Model 4**
Yes	
(Reference group: respondents who worked during enrollment with a C or D-range grade average)	
A-range	0.0639***
	(0.0248)
B-range	0.0466**
	(0.0235)
Constant	10.2468***
	(0.0537)
Marital status (Reference group: single/ widowed/ separated/ divorced)	0.1057***
Married or living common law	(0.0138)

[9] When we add the interaction of work experience during enrollment and overall grade average to our model specification, the coefficient estimate for the interaction term is statistically significant for the A-range * yes group. Thus, the grade-earnings relationship does depend on work-experience during enrollment. Results based on this specification are presented in Table A.5 in Appendix A.

Age (Reference group: less than 25)	
25 to 29	0.1019***
	(0.0152)
30 to 39	0.1481***
	(0.0206)
40 or more	0.1895***
	(0.0229)
Level of study (Reference group: college)	
Bachelor's	0.2180***
	(0.0152)
Master's or Doctorate	0.3281***
	(0.0322)
Gender (Reference group: female)	
Male	0.1759***
	(0.0147)
Predicted probability	0.2523**
	(0.1178)
R^2	0.1387
Number of observations	11,499
No	
(Reference group: respondents who did not work during enrollment with a C or D-range overall grade average)	
A-range	0.2024***
	(0.0483)
B-range	0.1045**
	(0.0473)
Constant	9.9061***
	(0.1008)
Marital status (Reference group: single/ widowed/ separated/ divorced)	
Married or living common law	0.0855***
	(0.0237)
Age (Reference group: less than 25)	
25 to 29	0.0705***
	(0.0267)
30 to 39	-0.0086
	(0.0281)
40 or more	-0.1248**
	(0.0405)
Level of study (Reference group: college)	
Bachelor's	0.3254***

	(0.0305)
Master's or Doctorate	0.2199***
	(0.0446)
Gender (Reference group: female)	
Male	0.2014***
	(0.0215)
Predicted probability	0.7473***
	(0.1959)
R^2	0.1647
Number of observations	3,564

Notes: Robust standard errors in parentheses.* statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, predicted probability, marital status and level of study. First-stage ordered probit results available on request.

Analysis by other education or training since graduation

Finally**,** OLS regressions are estimated separately for respondents who have obtained other education or training since graduation and respondents who have not obtained any other education or training since graduation. The parameter estimates from model 4 for each student group is shown in Table 4.7 below. The coefficient estimates for respondents who have obtained other education or training since graduation who graduated with an A-range and B-range overall grade average are positive but statistically insignificant. Thus, for respondents who have obtained other education or training since graduation who graduated with an A or B-range grade average, their demographic characteristics along with their work experience before graduation confounds the relationship that exists between their overall grade average and gross annual earnings. These results suggest that for respondents who have obtained other education or training since graduation, grades do not predict their labour market earnings. This additional postsecondary education or training, which is important in predicting job promotions, may

be enough to ensure higher earnings and this could be the reason why grades do not matter for this student group.

By contrast, the coefficient estimates for both grade groups are statistically significant at the five percent level for respondents who have not acquired any other education or training since graduation in 2015. In model 4, which controls for the effect of graduate's individual differences, respondents who have not acquired any other education or training since graduation who graduate with an A-range grade average earn approximately 16.18 percent more than their counterparts who have a C or D-range overall grade average. The annual earnings of respondents in this student group with a B-range grade average is 8.96 percent more than that of their colleagues with a C or D-range overall grade average. Hence, grades matter more for respondents who have not obtained any other education or training since graduation[10].

Table 4.7: Grade-earning relationship by other education or training since graduation

Other education or training since graduation	**Model 4**
Yes	
(Reference group: respondents who scored a C or D-range overall grade average and have acquired other education or training since graduation)	
A-range	0.0383
	(0.0381)
B-range	0.0381
	(0.0361)
Constant	10.0908***
	(0.1026)

[10] The results change when we add the interaction of other education or training dummy variable and overall grade average to model 4, presented in Table A.6 in Appendix A. The comparator group is respondents who have not obtained other education or training since graduation who score a C or D-range grade average. The coefficient estimate is negative and statistically significant for respondents who have obtained other education or training since graduation who score an A-range grade average. This indicates that there is a significant interaction effect between of other education or training since graduation. Hence the grade-earnings relationship varies by other education or training since graduation.

Predicted Probability	0.1634
	(0.1910)
Marital status (Reference group: single/ separated/ divorced/ widowed)	
Married or living common law	0.1529***
	(0.0246)
Age (Reference group: less than 25)	
25 to 29	0.0886***
	(0.0277)
	0.1141***
30 to 39	(0.0372)
	0.1278***
40 or more	(0.0446)
Gender (Reference group: females)	
Male	0.1829***
	(0.0235)
Worked during enrollment (Reference group: No)	0.0159
Yes	(0.0301)
Level of study (Reference group: college)	
Bachelor's	0.1939***
	(0.0245)
Master's or Doctorate	0.1947***
	(0.0655)
R^2	0.0784
Number of observations	4,941
No	
(Reference group: respondents who scored a C or D-range overall grade average and have not acquired other education or training since graduation)	
A-range	0.1619***
	(0.0265)
B-range	0.0896***
	(0.0261)
	10.1388***
Constant	(0.0482)
Predicted Probability	0.4503***
	(0.0987)
Marital status (Reference group: single/ separated/ divorced/ widowed)	
Married or living common-law	0.0445***
Age (Reference group: less than 25)	(0.0129)

25 to 29	
	0.0447***
30 to 39	(0.0142)
	0.0483***
40 or more	(0.0179)
	0.0477**
	(0.0224)
Gender (Reference group: female)	
Male	0.1853***
	(0.0121)
Worked during enrollment (Reference group: No)	
Yes	0.0598***
	(0.0127)
Level of study (Reference group: college)	
Bachelor's	0.2988***
	(0.0151)
Master's or Doctorate	0.3136***
	(0.0251)
R^2	0.1862
Number of observations	10,122

Notes: Robust standard errors in parentheses* statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, marital status, predicted probability, level of study and work experience during enrollment. First-stage ordered probit results available on request.

CHAPTER 5

This chapter provides a summary on the key findings for this thesis, a conclusion, study limitations and policy recommendations.

5.1 Summary, conclusion and study limitations

The objective of this paper was to examine the relationship between postsecondary education grades and labour market earnings in Canada and the moderating effects of field of study, gender, level of study, work experience during enrollment, and other education or training since graduation. All the empirical results from this study was based on data from the PUMF of the 2018 NGS which surveyed the 2015 cohort three years after graduation. Among the explanatory variables that were found to influence earnings are; overall grade average, gender, level of study, marital status, age at graduation, and work experience during enrollment.

This study first discussed the human capital and signalling/screening effect of grades. We then investigated some of the previous literature on the grade-earnings relationship. Empirical literature on the relationship between postsecondary education grades and labour market earnings was found to be generally inconclusive (Neuman &Weiss, 1995; Smart, 1988; Spence et al., 1975; Thomas, 2000). Only one study (Finnie et al., 2016) so far has been able to assess the relationship in the Canadian context as a result of scarcity of data on explicit information on graduates' cumulative grade average. This sets forth further analysis which we resorted to a two-stage least square regression in order to put this relationship into perspective.

Results after controlling for the effect of graduates' individual differences showed that a positive significant relationship exists between overall grade average and labour market earnings. Thus, gender, age at graduation, marital status, level of study and work experience during enrollment does not confound the qualitative relationship between overall grade average and labour market earnings for the 2015 cohort. Compared to respondents with a C or D-range overall grade average, scoring an A and B-range overall grade average was found to be associated with higher labour market earnings. This result suggests that higher grades are important as they do translate into higher labour market earnings. This positive grade-earnings relationship corroborates the findings of Gemus (2010), Jones & Jackson (1990), Kuncel et al. (2004) and Wise (1975). The result also supports the signalling/screening hypothesis implying that individuals with an A and B-range overall grade average have are more likely to get job interviews into higher paying job positions faster than individuals who have a relatively lower grade average. Also, for most of the regressions in this study, the coefficient estimates for work experience during enrollment was found to be statistically significant, indicating that work experience is also important in predicting earnings.

Further investigations revealed that the grade-earnings relationship varies by field of study, gender, level of study, work experience during enrollment and other education or training since graduation. Starting with level of study, the grade-earnings relationship was found to be positive among respondents with a college certificate or diploma who score an A-range overall grade average. Also, results from this study showed that earnings increase as grades increase among respondents with a bachelor's degree. Similarly, obtaining a high grade at the graduate level leads to higher earnings. Regarding field of study, overall grade

average was found to predict earnings for only respondents with academic credentials in business, management, public administration, social and behavioural sciences, law, mathematics, computer and information science, architecture, engineering and related technologies. For respondents with academic credentials in agriculture, natural resources, conservation, personal, protective, transportation services and education, their work experience during enrollment was found to be more important in predicting their earnings than their overall grade average.

Furthermore, overall grade average was found to be a good predictor of earnings among male and female graduates. Males with an A-range grade average earn more on average than males with a C and D-range grade average. Among females, the earnings of both those with an A and B-range overall grade average are higher than that of females with a C or D-range grade average.

Another interesting result in this study is that the grade coefficient estimates were bigger for respondents who did not work during enrollment in the postsecondary education program than they were for respondents who worked during enrollment. Thus, in the absence of work experience, grades are a stronger signal. Finally, results reveal that overall grade average matters more for respondents who have not obtained other education or training since graduation than respondents who have obtained other postsecondary education or training since graduation. For respondents who have obtained other postsecondary education or training since graduation, their addition education or training, which is important in predicting job promotion, is enough to ensure higher earnings.

The findings from this thesis contributes to existing literature in several ways. First, it is the second piece of Canadian evidence on the relationship between postsecondary

education grades and labour market earnings. Some of the results in this thesis were similar to that of Finnie et al. (2016), which is the first Canadian evidence on the grade-earnings relationship. Results from this thesis and that of Finnie et al. (2016) show that a positive grade-earnings relationship exists among respondents with bachelor's degree in business, management and social science. However, whereas Finnie et al. (2016) find that coefficient estimates are statistically significant for respondents with bachelor's degree in humanities, mathematics and computer science, the opposite was found in this thesis. The second contribution of this thesis to the current literature is that it is the first to examine the grade-earnings relationship by other education or training since graduation, revealing that grades do not predict earnings among respondents who obtained education or training since graduation whereas grades matter more for respondents who have not obtained other education or training since graduation. Third, this thesis also addresses the effects of work experience and how this tends to assuage the effect of grades on income.

There are some limitations in this study. First, academic grading systems vary according to the form of education, province and territory in which the university is located, and even the faculty. For instance, an A+ may be equal to 4.0 in one postsecondary institution whereas it could mean 4.5 in another institution depending on what grading scale the institution uses. Since grading schemes are not standardized across all institutions then students in a grade group from a particular postsecondary institution may not be directly comparable to students in same grade group from another institution and this can lead to errors in analysis (Finnie et al., 2016). Also, there are several other variables which could confound the grade-earnings relationship that were not controlled for in this study as there were no means to measure such variables in our data. These confounders include

the reputation of postsecondary education institution, personality traits, leadership, and interpersonal skills, which can all influence job promotion, performance and productivity, and in turn lead to higher earnings in the labour market (Wise, 1975). Future studies with data which has explicit information on these variables will be an important next step to examine the grade-earnings relationship.

Finally, grades could reflect several other things beyond cognitive ability. For instance, it may reflect an individual's socio-economic background, interest in studying, self-discipline, preferred job status in the labour market, time management skills etc. Therefore, what grades capture can be another interesting angle that future studies can focus on.

5.2 Policy recommendations

Based on the empirical results in this study, it is recommended that government implement policies that will enhance academic achievement in postsecondary education institutions. This can include provision of learning resources, designing courses that promote student engagement, supporting initiatives that train and enhances the professional development of professors, etc.

Postsecondary education institutions should also put in place measures that will enhance and develop academic staff's advisory skills. This can be achieved through staff seminars, workshops, mentoring etc. In addition to that, postsecondary education institutions in Canada should provide academic counselling services that informs students on ways to improve their grades and which majors will yield them the highest earnings.

Since grades do not matter among respondents who have obtained other education or training since graduation, students should be encouraged to further their education after graduation. Thus, students should pursue either a graduate degree, professional degree, on the job training etc. which will equally yield them higher labour market earnings.

Finally, since work experience during enrollment has been shown to be also important in predicting earnings, postsecondary education institutions should provide opportunities to combine academics with work experience. One way to achieve this is for career service to adopt strategies that will attract more students to enroll in co-operative education. Also, counselling services should provide students with information on how to effectively manage their time between studying and engaging in extracurricular activities.

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APPENDIX A: INTERACTION EFFECTS

Table A.1: Interaction effect between overall grade average and level of study

Variables	**Model 4**
Overall grade average * level of study (Reference group: C or D-range * College)	
A-range * Bachelor's	-0.0190
	(0.0452)
A-range * Master's/Doctorate	0.2751*
	(0.1561)
B-range * Bachelor's	0.0923
	(0.0436)
B-range * Master's/Doctorate	0.3131
	(0.1567)
Constant (α)	10.2025***
	(0.0445)
Gender (Reference group: females)	
Male	0.1737
	(0.0109)
Overall grade average (Reference group: C or D-range overall grade average)	0.0973***
A-range	(0.0337)
	0.0015
B-range	(0.0333)
Level of study (Reference group: college)	
Bachelor's	0.1831***
	(0.0398)
Master's / Doctorate	0.0624
	(0.1555)
Predicted probabilities	0.2787***
	(0.0764)
Marital status controls (Reference group: single/ separated/ divorced/ widowed)	0.1142***
Married or common-law	(0.0114)
Age controls (Reference group: less than 25)	
25 to 29	0.0769***
	(0.0136)
30 to 39	0.1087***
	(0.0161)
40 or more	0.1185***
	(0.0196)
Worked during enrollment (Reference group: No)	
Yes	0.0439***
	(0.0127)

R^2	0.1413
Number of observations	15,063

Notes: Robust standard errors in parentheses. * Statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, marital status, predicted probability, work experience during enrollment and level of study.

Table A.2: Interaction effect between overall grade average and field of study

Variables	**Model 4**
Overall grade average * field of study	
(Reference group: C or D-range * Education)	
A-range * Visual, performing arts and communications technologies	-0.0221
	(0.2456)
A-range * Humanities	-0.3127
	(0.2365)
A-range * Social and behavioural sciences and law	-0.1907
	(0.2122)
A-range * Business, management and public administration	-0.1335
	(0.2099)
A-range * Physical, life sciences and technologies	-0.3502
	(0.2272)
A-range * Mathematics, computer and information sciences	-0.1776
	(0.2177)
A-range * Architecture, engineering and related technologies	-0.2278
	(0.2104)
A-range * Health, parks, recreation and fitness	-0.2821
	(0.2149)
A-range * Other	-0.1467
	(0.2182)
B-range * Visual, performing arts and communications technologies	0.0697
	(0.2416)
B-range * Humanities	-0.2361
	(0.2367)
B-range * Social, behavioural sciences, and law	-0.1049
	(0.2135)
B-range * Business, management and public administration	-0.1784
	(0.2113)
B-range * Physical, life sciences and technologies	-0.2011
	(0.2271)
B-range * Mathematics, computer and information sciences	-0.2031
	(0.2215)
B-range * Architecture, engineering and related technologies	-0.1853
	(0.2118)
B-range* Health, parks, recreation and fitness	-0.2038
	(0.2164)
B-range * Other	-0.1357

	(0.2195)
Constant (α)	9.9319***
	(0.2062)
Gender (Reference group: females)	
Male	0.1314***
	(0.0116)
Overall grade average (Reference group: C or D-range overall grade average)	
A-range	0.3105
	(0.2064)
B-range	0.2315
	(0.2077)
Field of study (Reference group: Education)	
Visual and performing arts and communications technologies	-0.2346
	(0.2351)
Humanities	0.0594
	(0.2304)
Social and behavioural sciences and law	0.0860
	(0.2092)
Business, management and public administration	0.2653
	(0.2076)
Physical, life sciences and technologies	0.1853
	(0.2211)
Mathematics, computer and information sciences	0.3486
	(0.2135)
Architecture, engineering and related technologies	0.4056
	(0.2077)
Health, parks, recreation and fitness	0.3637
	(0.2122)
Other	0.1597
	(0.2140)
Level of study (Reference group: college)	
Bachelor's	0.2658***
	(0.0129)
Master's / Doctorate	0.3900***
	(0.0172)
Predicted probabilities	0.2564***
	(0.0779)
Marital status controls (Reference group: single/ separated/ divorced/ widowed)	0.1031***
Married or common-law	(0.0110)
Age controls (Reference group: less than 25)	
25 to 29	0.0649***
	(0.0132)
30 to 39	0.0957***
	(0.0159)
40 or more	0.1099***

	(0.0195)
Worked during enrollment (Reference group: No)	
Yes	0.0624*** (0.0124)
R^2	0.1860
Number of observations	15,063

Notes: Robust standard errors in parentheses. * Statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, marital status, predicted probability, work experience during enrollment and level of study.

Table A.3: Interaction effect between field of study and level of study

Variables	**Model 4**
Level of study * field of study (Reference group: College * Education)	
Bachelor's * Visual, performing arts and communications technologies	-0.1518 (0.1046)
Master's/Doctorate * Visual and performing arts and communications technologies	-0.3982*** (0.1485)
Bachelor's * Humanities	-0.0092 (0.1122)
Master's/Doctorate * Humanities	-0.2728** (0.1162)
	-0.0807 (0.0793)
Bachelor's * Social and behavioural sciences and law	-0.2783*** (0.0780)
Master's/Doctorate * Social and behavioural sciences and law	-0.0026 (0.0745)
Bachelor's * Business, management and public administration	-0.1941*** (0.0716)
Master's/Doctorate * Business, management and public administration	-0.3443*** (0.0949)
Bachelor's * Physical, life sciences and technologies	-0.4463*** (0.0899)
Master's/Doctorate * Physical, life sciences and technologies	-0.2361 (0.0967)
Bachelor's * Mathematics, computer and information sciences	-0.3124***
Master's/Doctorate * Mathematics, computer and information sciences	

	(0.0906)
Bachelor's * Architecture, engineering and related technologies	-0.0294
	(0.0767)
Master's/Doctorate * Architecture, engineering and related technologies	-0.4542***
	(0.0758)
Bachelor's * Health, parks, recreation and fitness	0.0804
	(0.0768)
Master's/Doctorate * Health, park, recreation and fitness	-0.1524**
	(0.0735)
Bachelor's* Other	-0.1011
	(0.0834)
Master's/Doctorate * Other	-0.3874
	(0.0825)
Constant (α)	10.0287***
	(0.0759)
Gender (Reference group: females)	
Male	0.1314***
	(0.0116)
Overall grade average (Reference group: C or D-range overall grade average)	
A-range	0.1116***
	(0.0214)
B-range	0.0622***
	(0.0205)
Level of study (Reference group: college)	
Bachelor's	0.3007***
	(0.0710)
Master's / Doctorate	0.6319***
	(0.0685)
Field of study (Reference group: Education)	
Visual and performing arts and communications technologies	-0.0652
	(0.0845)
Humanities	-0.1306
	(0.1019)
Social and behavioural sciences and law	0.0559
	(0.0707)
Business, management and public administration	0.1643***
	(0.0669)
Physical, life sciences and technologies	0.2597***
	(0.0817)
Mathematics, computer and information sciences	0.2444***
	(0.0807)
Architecture, engineering and related technologies	0.3184***
	(0.0671)
Health, parks, recreation and fitness	0.1569**
	(0.0684)

Other	0.1374* (0.0703)
Predicted probabilities	0.2605*** (0.0782)
Marital status controls (Reference group: single/ separated/ divorced/ widowed) Married or common-law	0.1015*** (0.0110)
Worked during enrollment (Reference group: No) Yes	0.0602*** (0.0126)
Age controls (Reference group: less than 25) 25 to 29	0.0694*** (0.0133)
30 to 39	0.0954*** (0.0158)
40 or more	0.1035*** (0.0195)
R^2	0.1918
Number of observations	0.15063

Notes: Robust standard errors in parentheses. * Statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, marital status, predicted probability, work experience during enrollment and level of study.

Table A.4: Interaction effect between overall grade average and gender

Variables	**Model 4**
Overall grade average * Gender (Reference group: C or D-range * Female) A-range * Male	-0.0159 (0.0426)
B-range * Male	-0.0175 (0.0423)
Constant (α)	10.1630*** (0.0436)
Gender (Reference group: females) Male	0.1908*** (0.0392)
Overall grade average (Reference group: C or D-range overall grade average) A-range	0.1077*** (0.0305)
B-range	0.0719** (0.0298)
Level of study (Reference group: college) Bachelor's	0.2230***

	(0.0129)
Master's / Doctorate	0.3582***
	(0.0172)
Predicted probabilities	0.2825***
	(0.0776)
Marital status controls (Reference group: single/ separated/ divorced/ widowed)	
Married or common-law	0.1129***
	(0.0114)
Age controls (Reference group: less than 25)	
25 to 29	0.0796***
	(0.0136)
30 to 39	0.1114***
	(0.0162)
40 or more	0.1203***
	(0.0197)
Worked during enrollment (Reference group: No)	
Yes	0.0421***
	(0.0127)
R^2	0.1387
Number of observations	15,063

Notes: Robust standard errors in parentheses. * Statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, marital status, predicted probability, work experience during enrollment and level of study.

Table A.5: Interaction effect between overall grade average and work experience during enrollment

Variables	**Model 4**
Overall grade average * Worked during enrollment (Reference group: C or D-range * No)	
A-range * Yes	-0.1036**
	(0.0528)
B-range * Yes	-0.0595
	(0.0532)
Constant (α)	10.1133***
	(0.0555)
Gender (Reference group: females)	
Male	0.1733***
	(0.0109)
Overall grade average (Reference group: C or D-range overall grade average)	
A-range	0.1779***
	(0.0476)
	0.1081**

B-range	(0.0479)
Level of study (Reference group: college)	
Bachelor's	0.2224***
	(0.0129)
Master's / Doctorate	0.3581***
	(0.0172)
Predicted probabilities	0.2771***
	(0.0775)
Marital status controls (Reference group: single/ separated/ divorced/ widowed)	0.1128***
Married or common-law	(0.0113)
Age controls (Reference group: less than 25)	
25 to 29	0.0795***
	(0.0136)
30 to 39	0.1123***
	(0.0162)
40 or more	0.1211***
	(0.0197)
Worked during enrollment (Reference group: No)	
Yes	0.1223**
	(0.0496)
R^2	0.1399
Number of observations	15,063

Notes: Robust standard errors in parentheses. * Statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, marital status, predicted probability, work experience during enrollment and level of study.

Table A.6: Interaction effect between overall grade average and other education and training since graduation

Variables	**Model 4**
Overall grade average * Other education or training since graduation (Reference group: C or D-range * No)	
A-range * Yes	-0.1100**
	(0.0455)
B-range * Yes	-0.3769*
	(0.1951)
Constant (α)	10.2203***
	(0.0419)
Gender (Reference group: females)	
Male	0.1705***
	(0.0108)

Overall grade average (Reference group: C or D-range overall grade average)	
A-range	0.1579***
	(0.0264)
B-range	0.0896***
	(0.0262)
Level of study (Reference group: college)	
Bachelor's	0.2354***
	(0.0128)
Master's / Doctorate	0.3396***
	(0.0169)
Predicted probabilities	0.2536***
	(0.0761)
Marital status controls (Reference group: single/ separated/ divorced/ widowed)	
Married or common-law	0.0973***
	(0.0111)
Age controls (Reference group: less than 25)	
25 to 29	0.0559***
	(0.0134)
30 to 39	0.0866***
	(0.0159)
40 or more	0.0935***
	(0.0194)
Worked during enrollment (Reference group: No)	
Yes	0.0543***
	(0.0126)
R^2	0.1647
Number of observations	15,063

Notes: Robust standard errors in parentheses. * Statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, marital status, predicted probability, work experience during enrollment and level of study.

APPENDIX B.

Table B.1: First stage ordered probit regression estimates for Table 4.1

	Dependent variable: Overall grade average **Maximum Likelihood Estimator: Ordered Probit**
Variables	**Model 3**
Highest education before enrollment in 2015 program (Reference group: college)	
Bachelor's	-0.2199***
	(0.0414)
Master's or doctorate	-0.1273***
	(0.0644)
Other	0.1436*
	(0.0804)
Mother's education level (Reference group: less than a high school diploma/ equivalent certificate)	
High school diploma or its equivalent	-0.1259***
	(0.0418)
Trade certificate or diploma	0.0610
	(0.0546)
College/ CEGEP/ Other non-university certificate or diploma	-0.1451***
	(0.0438)
University below bachelor's/ bachelor's	-0.1835***
	(0.0442)
University above the bachelor's/ master's/ doctorate	-0.2517***
	(0.0548)
Father's education level (Reference group: less than a high school diploma/ equivalent certificate)	
High school diploma or its equivalent	-0.0818**
	(0.0390)
Trade certificate or diploma	-0.0456
	(0.0449)
College/ CEGEP/ Other non-university certificate or diploma	-0.0954**
	(0.0442)
University below bachelor's/ bachelor's	-0.0709*
	(0.0410)
University above the bachelor's/ master's/ doctorate	-0.0829*
	(0.0410)
Gender (Reference group: female)	
Male	0.1114***
	(0.0215)
Marital status (Reference group: single/ separated/ divorced/ widowed)	
Married or living common-law	-0.0882***
	(0.0233)

Worked during enrollment (Reference group: No)	
Yes	-0.0627**
	(0.0253)
Age (Reference group: less than 25)	
25 to 29	0.0547*
	(0.0304)
30 to 39	-0.1134***
	(0.0352)
40 or more	-0.1558**
	(0.0427)
Level of study for 2015 program (Reference group: college)	
Bachelor's	0.1493***
	(0.0249)
Master's or Doctorate	-0.3696***
	(0.0395)
Pseudo R^2	0.0316
Number of observations	19,564

Notes: Robust standard errors in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. Regressors include age, gender, marital status, level of study, mother's education level, father's education level, work experience during enrollment and highest level of education before enrollment in 2015 program.