Grades and Labour Market Earnings in Canada: New Evidence from the 2018 National Graduates Survey

Article *in* SSRN Electronic Journal · January 2020

DOI: 10.2139/ssrn.3667861

Richard E Mueller
University of Lethbridge

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

Josephine Essilfie
Department of Economics
University of Lethbridge
essilfie@uleth.ca

Richard E. Mueller
Department of Economics
University of Lethbridge
richard.mueller@uleth.ca

4 August 2020

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 during school, and all education and formal education acquired since graduation. We analyze 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. Unlike previous waves of the NGS, the 2018 data contain explicit information on the final grade averages awarded to graduates of postsecondary education programs. Using a two-stage least square regression method, we find 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 – with some exceptions – important as they do translate into higher labour market earnings. However, work experience and additional education or training tend to somewhat mitigate these effects, suggesting that the strength of the grade average signal to employers is weakened.

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

1. Introduction

The effects of postsecondary education grades on labour market earnings is a neglected area of research in Canada, a fact largely attributable to the limited data available on graduates' overall grade point averages. To the best of our 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, or a college diploma in arts and education. However, they found no significant grade-earnings relationship for graduates with bachelor's degrees in the fine arts. These findings suggest that more studies are needed to better understand the relationship between grades and earnings in the Canadian context.

The overall goal of this 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 all formal education and training acquired since graduation. The findings from this study contribute to the existing literature in several ways. First, it is only the second piece of Canadian evidence on the relationship between postsecondary education grades and labour market earnings. The second contribution of this study 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, and similar to the previous point, this study addresses the effects of work experience during the period of study and how this tends to assuage the effect of grades on income.

We find that grades and labour market earnings are positively related, although additional formal education and training and/or work experience tend to reduce the importance of this relationship. We attribute this to the fact that grades act as a signal that are a proxy for labour productivity and earnings, a proxy that becomes less important as a signal when additional human capital is revealed through labour market experience and further training.

The remainder of this paper is structured as follows. Section two contains a brief literature review and it discusses how postsecondary education grades influence labour market earnings using both human capital theory and the screening or signalling hypothesis. Section three outlines the study design, the data source, and the variables and analytical procedures used for the model estimations. Results obtained from these estimated models are presented and discussed in section 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 section five.

2. Literature review

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 as an explanation of why higher postsecondary education grades may lead to higher labour market earnings.

According to the signalling/screening hypothesis, workers use education to "signal" their unobserved innate ability to employers, while employers use education to "screen" or filter workers (Helmreich and Stapp, 1974; Spence et al., 1975). Education provides individuals with academic credentials and it is these credentials that provide a signal to potential employers about an individual's unobserved abilities, abilities that are positively correlated with an individual's productivity. Similarly, these unobserved attributes – such as innate ability and work ethic which are correlated with productivity – allow firms to use education and other indicators as proxies to make inferences about these unobserved attributes and to screen the pool of applicants, ultimately selecting the individuals best suited for the job. Thus, higher education acts as a filter by employers and is used to screen out more able (i.e., more productive) workers.

Since academic grades are one component of postsecondary education, the signalling/screening hypothesis suggests that individuals who graduate from postsecondary institutions with higher grades may have a better chance of obtaining a better paying job compared to others in the applicant pool who graduate with lower grades. Thus, overall, these grades should be an important predicter their labour market outcome in terms of securing a job with higher compensation. 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 of grades can be measured.[1]

Another benefit of postsecondary education grades is based on human capital theory that proposes that higher levels of education lead to increased productivity and hence higher earnings. The theory posits that education provides individuals with knowledge and skills that make the individual more productive and thus ensure higher earnings power in the labour market. If

[1] Basically, good grades help to open doors for students entering the labour market. Once employed for a period of time, job performance then better "reveals" the true productivity of the individual. We thus expect grades to be of less importance the longer an individual has been employed or, according to the signalling/screening hypothesis, once a better signal is available (such as actual work performance).

education enhances productivity as this human capital theory proposes, then it is also possible that different grades will have differential effects on the earnings of individuals in the labour market. Academic grades may be an indicator of cognitive ability and potential to excel in the labour market (Reilly et al., 1993). To achieve good grades at the postsecondary education level requires certain characteristics such as self-discipline, good time management skills, interest in learning, and other unobserved skills which – in addition to the knowledge and skills obtained – may contribute to higher labour productivity. Individuals who graduate from postsecondary institutions with lower grades may not possess these important characteristics, at least in the amount necessary to be rewarded more generously in the labour market. Increased productivity will ensure better job performance and better-paying jobs. Hence, the human capital effect of grades can be measured by examining the effects of postsecondary education grades on earnings for a relatively longer period after graduation.

Several studies applying human capital theory and the signalling/screening hypothesis have confirmed that a relationship does exist between grades and earnings. In Australia, Chia and Miller (2008) used data from the Graduate Destination Survey 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. Research by Wise (1975) has 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.

Jones and Jackson (1990) found a larger GPA-earning relationship than Wise (1975), and their results also provided evidence in support of human capital theory. The study – based on a sample of 811 employees with an undergraduate degree from a large public university – 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, on a three-point scale, resulted in an 8.9 percent increase in annual earnings. However, this study may not be generalizable since they focused on employees who graduated from only a single university and were employment by a single firm. These results could be different if the sample size is increased to include graduates from multiple universities and/or multiple firms.

One of the earlier reviews on the relationship between grades and labour market outcomes was by Hoyt (1965). He found a very small (i.e., 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 all found to have only a very small relationship with job performance as measured by supervisor ratings. The study did not find grades to be associated with the initial salary. These results suggest that the firm placed greater monetary value on the level of education rather than on the academic achievement during that education. 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 with this lack of variation it is difficult to know how job performance and the salary would be affected by a lower grade point average. However, this result may also indicate selectivity bias – and indeed be supportive of the theory – if grades were used to screen lower quality candidates who therefore would not but included in their data.

Overall, the empirical literature on the grade-earnings relationship is inconclusive. On one hand, some studies have identified that grades are important predictors of job performance, promotion rate, and earnings (Kuncel et al., 2004; Thomas, 2000; Wise, 1975). On the other hand, studies have also found little or no statistically significant relationship between grades and 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. Only one study, to the best of our knowledge, examines the grade-earnings relationship by field of study in Canada: Finnie et al. (2016). The study 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 focus 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.

Other studies which examined the grade-earning relationship by field of study have also shown that 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 and Weiss, 1995; Smart, 1988; Spence et al., 1975; Thomas, 2000). However, this relationship between grades and earnings is weak among individuals in occupations requiring qualifications in the social sciences, humanities, and fine arts (Chia and Miller, 2008). 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 an individual is underemployed, then regardless of higher grades or higher productivity their earnings may still be relatively low.

A major limitation of existing literature is that most of these studies have focused on graduates from a single postsecondary education institution and/or employees from a single firm. Consequently, these results may not be generalizable and thus cannot be interpreted as reflecting the true overall relationship between grades and labour market outcomes. Also, several factors operating at the individual level and within the labour market play confounding roles in the relationship between grades and earnings which have not been controlled. For instance, the grades-earnings relationship could be different for individuals who were employed while studying and for those who obtained additional education or training after graduation, both of which could lead to higher earnings. To the best of our knowledge, neither of these has previously been examined in the Canadian context.

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 perhaps receive job promotions faster than their counterparts with little or 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 may have been more likely to focus on their academic work and hence may obtain good grades with a higher 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 in their postsecondary education program, but rather due to these additional qualifications.

3. Data description and model

This study analyzes a cross-sectional data from the Public Use Microdata File (PUMF) of the 2018 National Graduates Survey (NGS) (Statistics Canada, 2019) which follows the 2015 cohort of graduates three years after graduation and provides some insight into graduates' post-graduation occupational outcomes. The target population of the 2018 NGS includes graduates living in Canada who completed their program sometime in 2015 from a recognized Canadian postsecondary 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. The overall response rate to the survey is 63 percent.

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 degrees, diplomas 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 at the time of the survey. Unfortunately, the survey did not adjust for this under-coverage at the weighting stage. Only observations with gross annual earnings that are not valid skips or missing are included in the analysis that follows.

3.1 Variable descriptions

Gross annual earnings in Canadian dollars

The dependent variable for this study is the gross annual earnings in Canadian dollars from the job held in the week prior to the survey in 2018. We use this variable to eliminate the effects of tax transfer programs and tax credits that affect the after-tax earnings of some graduates. Another measure of income in the NGS is total personal income from all sources which includes job income and all other sources of income besides labour market income such as transfer payments, investment income, etc. Since we are concerned with the effect of grades on labour market income, we will use the gross annual earnings variable as our dependent variable, although the two are highly and positively correlated (r=0.7740 in our sample).

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-. For the purpose of this study, these three categories will be referred to as the A-range, the B-range, and the C or D-range, respectively.

Field of study

Field of study categories in the 2018 NGS is based on Statistics Canada's 2016 Classification of Instructional Programs (CIP). 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).[2]

3.2 Empirical model

This study uses 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. Since then the

---

[2] Demographic characteristics to be included in the empirical analysis as control variables include age at graduation, gender, marital status and parent's education level, all of which are categorical variables. Other control variables include work experience during enrollment, highest level of education before enrollment, other education or training since graduation and level of study. These variables are all categorical variables that are recoded into a set of dummy variables.

method has been widely used in the labour economics literature to measure gains from education using a variety of linear regression models (Chia and 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, the following baseline model is used to assess the relationship between log transformation of annual earnings and overall grade average, without controlling for covariates:

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

where ln (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, with C or D-range as 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, again, those with a 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.

We control for the effect of graduates' work experience during enrollment, level of study and personal demographic characteristics in model 2 as follows:

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

where 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 all 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 the coefficient to be estimated. However, both models 1 and 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 will be correlated with the error term μ_i. G_i will therefore be endogenous and the estimates of β will be biased, so it is important to correct this endogeneity. We do this by employing the two-stage regression procedure where we estimate the reduced form model below in the first stage:

$$G_i^* = \pi Z_i + + \eta X_i + \Omega EXP_i + v_i \tag{3}$$

where X_i and EXP_i have already been 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 is estimated using an ordered probit regression method. 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 $\delta_2 < G_i^*$ (C or D-range)

The δs are threshold parameters (cut-off points between successive alternatives) to be estimated along with π. Model 3 will be estimated using robust standard errors. The predicted probabilities from this model will be obtained and used in the second stage.

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.

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

where $\mu_i = \rho \hat{v}_i + \varepsilon_i$, $\hat{v}_i$ 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: $\rho=0$. 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.[3]

3.3 Descriptive statistics

Table 1 shows details of the summary statistics for all the variables. Here average gross annual earnings in Canadian dollars for the 2015 cohort are $44,463 while median earnings are $45,000. The majority of the respondents graduate with an A-range overall grade average (48.5%) with a slightly lower proportion in the B-range (41.4%) and very few in the C to D-range (10.1%).

[3] The grade-earnings relationship is also estimated separately by subsample. We disaggregate regressions based on model 4 by level of study, work experience during enrollment , gender, field of study, and other education or training since graduation. Results based on these disaggregated regressions are presented in Tables 3 through 6 and Table A3 in the Appendix.

Most individuals in the sample are either single, divorced, widowed, or separated (53.6%), a plurality have qualifications in business, management, and public administration (23.0%), have mothers and fathers who have a university education at or below a bachelor's degree (25.5% and 22.6%, respectively), are less than 25 year of age (49.3%), and have a bachelor's degree (42.7%). The number of respondents who worked during enrollment are more than respondents who did not work during enrollment (76.3% and 26.7%, respectively). Regarding gender, about 60.1% of the respondents are females whereas males are about 39.9% of the entire sample. Most of the respondents have not obtained any other formal education or training since graduation (67.2%). Finally, majority of the respondents had no previous postsecondary education before enrollment in their 2015 program (52.4%).[4]

4. Results

The first column of Table 2 shows the OLS estimates from the baseline model (model 1) which does not control for covariates.[5] The 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. Since model 1 omits observable variables (X) and

[4] All "valid skip" and "not stated" values were assumed to be equivalent to no previous PSE. This figure also includes the small number of responses (n=282) in the "other" category. Table A1 in the Appendix shows the distribution of overall grade averages across level of study. In order to maximize sample size, variables where retained conditional on the income from the job in the previous week variable (i.e., "JOBINCP") having a valid value (i.e., a stated dollar value). Conditional on this, other variables that had a small number of missing values were categorized into a valid category. For example, if parental education was "not stated" in the data, it was coded to be "less than a high school diploma or its equivalent." Complete details of these recodings are available upon request.

[5] 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 = $100 \cdot [e^{\beta} - 1]$, where e is the mathematical constant 2.71828127.

unobservable variables that affects both grades and labour market earnings, coefficient estimates based on model 1 are biased.

We adopt the two-stage regression procedure already discussed in the previous section to correct for this possible endogeneity problem. Results from the first stage ordered probit model (model 3) are presented in the Appendix Table A2. The third column of Table 2 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) is indeed endogenous and hence OLS can only consistently estimate β if we estimate model 4.

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 10.32 percent and 6.74 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 but the qualitative result is robust to endogeneity correction. Based on results from model 4, one can say that even in the presence of graduates' individual differences, overall grade average has a direct positive effect on labour market earnings. Inclusion of the covariates does not take away the effect it has on labour market earnings. 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.

Higher grades do appear to translate into higher labour market earnings, but these results may differ depending on gender, level or field of study, whether an individual worked during their studies, and if they obtained additional formal training after graduation. Here we concentrate on the relationship between grades and earnings by level of education obtained, by whether an individual worked while attending their higher education program, by gender, and finally by whether an individual has obtained other formal education or training since graduation. These results are contained (in the order mentioned) in Tables 3 through 6.[6]

The importance of grades appears, at least at first glance, to differ by level of study. Thus, for example, grades in the A- and B-ranges are very high for those graduating with a master's or doctoral degree (Table 3), with higher earnings among those in the A-range. However, at this level of education there are only a handful of respondents who claimed to graduate will grades lower than this (i.e., one percent in Table A1). Thus, almost everyone with a graduate degree is an A-or B-range student. For those graduating with a bachelor's degree, grades are less important and the difference between the A- and B-ranges is minimal. For college graduates, however, earning a grade average in the A-range is related to earnings about 10.07 percent higher than those with lower grades. Work experience is also important, yielding participants earnings about 6.51 percent higher than those who did not have similar experience. This is to be expected for college graduates (which, recall, include trade school graduates) given the vocational nature of these types of

[6] Results by field of study can be found in the Appendix in Table A3. When we disaggregate results based on model 4 by field of study (Table A3) we find that the grade coefficients are positive and statistically significant at at least the five percent level for only respondents with credentials in four of the ten categories: social and behavior sciences and law; business, management, public administration; mathematics, computer and information science; architecture, engineering and related technologies.

programs. Of course, we have no way of knowing if the work experience during enrollment was related to the program of study (e.g., a co-operative education or an internship).

To investigate the importance of work experience on earnings, we disaggregate the sample into those who worked during their educational programs and those who did not. These estimates are in Table 4 and the two groups provide an interesting contrast regarding the importance of grades on earnings. Those with work experience have smaller coefficients on the two grade variables than those without experience, although the coefficient values are still significant at at least the five percent level. This suggests that in the absence of work experience, grades may act as a stronger signal for employees (and a stronger screening mechanism for employers).

Table 5 repeats this exercise but now estimating separate models for males and females. The results here are almost identical to those in Table 2 (where males and females were aggregated into one sample). Again, we see that having a B-range average pays more than having a lower grade average, while those in the A-range have even higher earnings. Females, however, tend to have higher rates of return to their university education at either level compared to males. This is largely reflecting the well-paid fields that men with a college or trade school education enter following graduation, reducing the university premium for males.

The grade-earnings relationship also varies among individuals who have obtained additional training after graduation and individuals who have not. Results based on model 4, and presented in Table 6, show that the grade coefficients are statistically significant for only respondents who did not obtain this additional training after graduation. Hence, grades matter more for respondents who have not obtained any other education or training since graduation. This is similar to the result in Table 4 where we also find that work experience during school tends to mitigate some of the positive relationship between higher grades and higher earnings.

In sum, 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 may 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). However, the efficacy of grades as a signal seems to be moderated when additional formal education or training or work experience are taken into consideration. Whether these two factors are better measures of productivity or they simply act as better signals cannot be determined from our estimates.

5. Concluding remarks

Using cross-sectional data from the PUMF of the 2018 NGS, this study provides (what we believe to be) only the second piece of Canadian evidence for the relationship between postsecondary education grades and labour market earnings. Results from both descriptive statistics and regression analyses indicate that a positive relationship exists between overall grade average and labour market earnings. This result suggests that higher grades are important as they do translate into higher labour market 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. The regression analysis revealed two interesting results. First, in the absence of work experience, grades are a stronger signal for employees (and a stronger screening mechanism for employers). Second, overall grade average matters more for respondents who have not obtained additional formal education or training since graduation than respondents who have obtained other postsecondary education or training since graduation.

There are some limitations in this study. First, 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.

Second, 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 for future studies.

Lastly, academic grading systems vary according to the form of education, province and territory in which the university is located, and even the faculty. Since grading schemes are not standardized across all institutions, 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).

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. Finally, since work experience during enrollment is 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.

REFERENCES

Bretz Jr, R. D. (1989). College grade point average as a predictor of adult success: A meta-analytic review and some additional evidence. *Public Personnel Management* 18(1), 11-22. doi:10.1177/009102608901800102.

Chia, G., & Miller, P. W. (2008). Tertiary performance, field of study and graduate starting salaries. *Australian Economic Review* 41(1), 15-31. doi:10.1111/j.1467-8462.2008.00471.x.

Dalessio, A. (1986). Academic success and job performance of engineering and scientific personnel. *IEEE Transactions on Engineering Management* EM-33(2), 67-71. doi:10.1109/TEM.1986.6447643.

Donhardt, G. L. (2004). In search of the effects of academic achievement in postgraduation earnings. *Research in Higher Education* 45(3), 271-284. doi:10.1023/B:RIHE.0000019590.58766.af.

Ferris, K. R. (1982). Educational predictors of professional pay and performance. *Accounting, Organizations and Society* 7(3), 225-230. doi:10.1016/0361-3682(82)90003-4.

Finnie, R., Pavlic, D., Afshar, K., Bozkurt, E., & Miyairi, M. (2016). *Do better grades in post-secondary education lead to better labour market outcomes?* Retrieved from www.epri.ca, 4 August 2020.

Gemus, J. (2010). *College achievement and earnings*. Retrieved from http://nbn-resolving.de/urn:nbn:se:uu:diva-112808, 4 August 2020.

Helmreich, R., & Stapp, J. (1974). Short forms of the texas social behavior inventory (tsbi), an objective measure of self-esteem. *Bulletin of the Psychonomic Society* 4(5), 473-475. doi:10.3758/BF03334260.

Hoyt, D. P. (1965). The relationship between college grades and adult achievement. A review of the literature. American College Testing Center, Research and Development Division, Iowa City, Iowa. Retrieved from https://files.eric.ed.gov/fulltext/ED023343.pdf, 4 August 2020.

Jones, E. B., & Jackson, J. D. (1990). College grades and labor market rewards. *The Journal of Human Resources* 25(2), 253-66.

Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2004). Academic performance, career potential, creativity, and job performance: Can one construct predict them all? *Journal of Personality and Social Psychology* 86(1), 148-161. doi:10.1037/0022-3514.86.1.148.

Loury, L. D., & Garman, D. (1993). Affirmative action in higher education. *The American Economic Review* 83(2), 99-103.

Mincer, J. (1974). *Schooling, Experience, and Earnings.* National Bureau of Economic Research.

Neuman, S., & Weiss, A. (1995). On the effects of schooling vintage on experience-earnings profiles: Theory and evidence. *European Economic Review* 39(5), 943-955. doi:10.1016/0014-2921(94)00019-V.

Reilly, R., Warech, M., & Reilly, S. (1993). *The influence of self-monitoring on the reliability and validity of upward feedback*. Paper presented at the Annual Meeting of the Society for Industrial and Organizational Psychology, San Francisco, CA.

Smart, J. C. (1988). College influences on graduates' income levels. *Research in Higher Education* 29(1), 41-59. doi:10.1007/BF00992142.

Spence, J. T., Helmreich, R. L., & Stapp, J. (1975). Ratings of self and peers on sex role attributes and their relation to self-esteem and conceptions of masculinity and femininity. *Journal of Personality and Social Psychology* 32(1), 29-39. doi:10.1037/h0076857.

Thomas, S. L. (2000). Deferred costs and economic returns to college major, quality, and performance. *Research in Higher Education* 41(3), 281-313. doi:10.1023/A:1007003510102.

Wise, D. A. (1975). Academic achievement and job performance. *American Economic Review* 65(3), 350-366.

Table 1: Descriptive statistics

Variable	Frequency	%
Gross annual earnings (Mean = $44,463 Median = $45,000)	15,063	100.0
Overall grade average		
A-range	7,301	48.5
B-range	6,234	41.4
C or D-range	1,528	10.1
Marital status		
Married or living common-law	6,986	46.4
Single/separated/widowed/divorced	8,077	53.6
Field of study		
Education	1,234	8.2
Visual and performing arts, and communications	480	3.2
Humanities	579	3.8
Social and behavioral sciences and law	2,234	14.8
Business, management and public administration	3,465	23.0
Physical and life sciences and technologies	816	5.4
Mathematics, computer and information sciences	606	4.0
Architecture, engineering and related technologies	2,049	13.6
Health, parks, recreation and fitness	2,709	18.0
Other (Agriculture, Transportation, Protective services)	891	6.0
Mother's education		
Less than a high school diploma or its equivalent	2,098	13.9
High school diploma or a high school equivalency certificate	3,588	23.8
Trade certificate or diploma	1,062	7.1
College, CEGEP or other non-university certificate or diploma	2,886	19.2
University below Bachelor’s/ Bachelor’s	3,843	25.5
University above Bachelor’s/ Master’s/ Doctorate	1,586	10.5
Father's education		
Less than a high school diploma or its equivalent	2,764	18.3
High school diploma or a high school equivalency certificate	3,056	20.3
Trade certificate or diploma	1,748	11.6
College, CEGEP or other non-university certificate or diploma	1,974	13.1
University below Bachelor’s/ Bachelor’s	3,398	22.6
University above Bachelor’s/Master’s/ Doctorate	2,123	14.1
Age		
Less than 25	7,429	49.3
25 to 29	3,490	23.2
30 to 39	2,664	17.7
40 or more	1,480	9.8
Level of study		
College	4,695	31.2
Bachelor’s	6,436	42.7
Master’s or Doctorate	3,932	26.1

cont . . .

Table 1: Descriptive statistics, continued

Variable	Frequency	%
Work experience during enrollment		
Yes	11,499	76.3
No	3,564	26.7
Gender		
Male	6,012	39.9
Female	9,051	60.1
Other education or training since graduation		
Yes	4,941	32.8
No	10,122	67.2
Highest level of education completed before the 2015 progra		
Other & no previous postsecondary education	7,901	52.4
College	1,864	12.4
Bachelor’s	4,286	28.5
Master’s/Doctorate	1,012	6.7
Sample size	15,063	

Source: Researchers' calculations based on data from NGS 2018.

Table 2: Key parameter estimates on the grade-earnings relationship

Variables	Model 1 (Baseline model)	Model 4 (Second-stage regression)
A-range grade average	0.1778***	0.1032***
	(0.0225)	(0.0225)
B-range	0.0924***	0.0674***
	(0.0224)	(0.0215)
Predicted probabilities		0.4336***
(from ordered probit)		(0.1095)
Male		0.1907***
		(0.0121)
Married or living common-law		0.1029***
		(0.0119)
25 to 29 years old at graduation		0.0942***
		(0.0131)
30 to 39 years old		0.0982***
		(0.0170)
40 or more years old		0.1018***
		(0.0204)
Level of study - Bachelor's		0.2469***
		(0.0137)
Level of study - Master's/Doctorate		0.2978***
		(0.0278)
Work experience during enrollment		0.0283**
		(0.0128)
Constant	10.6065***	10.1058***
	(0.0207)	(0.0509)
R^2	0.0095	0.1398
Number of observations	15,063	15,063

Notes: Robust standard errors are in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels, respectively.

Table 3: Grade-earnings relationship by level of study

	Model 4	Model 4	Model 4
	College	Bachelor's	Master's/ Doctorate
A-range	0.1007***	0.0861***	0.3602**
	(0.0343)	(0.0312)	(0.1497)
B-range	0.0046	0.0983***	0.3063**
	(0.0336)	(0.0289)	(0.1507)
Predicted probabilities	0.3136**	0.2357	0.3194**
(from ordered probit)	(0.1237)	(0.1943)	(0.1618)
Male	0.2609***	0.1593***	0.0786***
	(0.0199)	(0.0201)	(0.0179)
Married or living common-law	0.1168***	0.1261***	0.0554***
	(0.0201)	(0.0187)	(0.0209)
25 to 29 years old at graduation	0.0869***	0.1275***	0.0132
	(0.0260)	(0.0212)	(0.0262)
30 to 39 years old	0.0990***	0.0873***	0.1139***
	(0.0306)	(0.0300)	(0.0261)
40 or more years old	0.0453	0.0932**	0.1997***
	(0.0349)	(0.0411)	(0.0286)
Work experience during enrollment	0.0651***	-0.0209	0.0529***
	(0.0214)	(0.0231)	(0.0206)
Constant	10.1286***	10.4624***	10.2872***
	(0.0629)	(0.0729)	(0.1938)
R^2	0.092	0.0536	0.0554
Number of observations	4,695	6,436	3,932

Notes: Robust standard error are in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels, respectively. First-stage ordered probit results available on request.

Table 4: Grade-earnings relationship by work experience during enrollment

	Model 4	Model 4
Work experience during enrollment	Yes	No
A-range	0.0679***	0.2109***
	(0.0250)	(0.0487)
B-range	0.0514**	0.1100**
	(0.0237)	(0.0479)
Predicted probabilities	0.2504**	0.6558***
(from ordered probit)	(0.1177)	(0.1975)
Male	0.1769***	0.1954***
	(0.0148)	(0.0214)
Married or living common law	0.1092***	0.0926***
	(0.0138)	(0.0235)
25 to 29 years old at graduation	0.1012***	0.0841***
	(0.0152)	(0.0263)
30 to 39 years old	0.1450***	0.0008
	(0.0209)	(0.0279)
40 or more years old	0.1895***	-0.1221**
	(0.0229)	(0.0412)
Level of Study - Bachelor's	0.2200***	0.3168***
	(0.0153)	(0.0305)
Level of study - Master's/Doctorate	0.3292***	0.2277***
	(0.0324)	(0.0457)
Constant	10.2413***	9.9427***
	(0.0538)	(0.1015)
R^2	0.1389	0.1671
Number of observations	11,499	3,564

Notes: Robust standard errors are in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels, respectively. First-stage ordered probit results and full OLS results available on request.

Table 5: Key parameter estimates among male and female graduates

	Model 4	Model 4
	Males	Females
A-range	0.1150***	0.0924***
	(0.0319)	(0.0311)
B-range	0.0659**	0.0671**
	(0.0304)	(0.0301)
Predicted probabilities	0.2519	0.4710***
(from ordered probit)	(0.2071)	(0.1161)
Married or common-law	0.1373***	0.0882***
	(0.0198)	(0.0149)
25 to 29 years old at graduation	0.0609***	0.1217***
	(0.0201)	(0.0175)
30 to 39 years old	0.0589*	0.1304***
	(0.0308)	(0.0205)
40 or more years old	0.0554	0.1292***
	(0.0359)	(0.0248)
Level of study - Bachelor's	0.1879***	0.2878***
	(0.0219)	(0.0177)
Level of study - Master's/Doctorate	0.2352***	0.3699***
	(0.0531)	(0.0303)
Work experience during enrollment	0.0207	0.0318*
	(0.0182)	(0.0184)
Constant	10.4192***	10.0486***
	0.0832	0.0565
R^2	0.1055	0.1418
Number of observations	6,012	9,051

Notes: Robust standard errors are in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels, respectively. First-stage ordered probit results and full OLS results available on request.

Table 6: Grade-earning relationship by training/education since graduation

	Model 4	Model 4
Other training or education since graduation	Yes	No
A-range	0.0427	.1659***
	(0.0383)	(0.0268)
B-range	0.0442	.0929***
	(0.0363)	(0.0265)
Predicted probabilities	0.3587	0.4333***
(from ordered logit)	(0.2277)	(0.0988)
Male	0.1823***	0.1842***
	(0.0236)	(0.0121)
Married or living common law	0.1550***	0.0503***
	(0.0245)	(0.0129)
25 to 29 years old at graduation	0.0889***	0.0495***
	(0.0277)	(0.0143)
30 to 39 years old	0.1143***	0.0485***
	(0.0377)	(0.0181)
40 or more years old	0.1258***	0.0466**
	(0.0451)	(0.0226)
Level of Study - Bachelor’s	0.1992***	0.2959***
	(0.0247)	(0.0150)
Level of study - Master’s/Doctorate	0.1968***	0.3128***
	(0.0652)	(0.0254)
Work experience during enrollment	0.0155	0.0559***
	(0.0304)	(0.0127)
Constant	10.0874***	10.1448***
	(0.1023)	(0.0483)
R^2	0.0797	0.1866
Number of observations	4,941	10,122

Notes: Robust standard errors are in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels, respectively. First-stage ordered probit results and full OLS results available on request.

Table A1: Distribution of overall grade average across levels of study

	Frequency (%)		
	A-range	B-range	C and D-range
College	45.0	44.3	10.7
Bachelor’s	34.2	55.4	10.4
Master’s/Doctorate	72.3	26.7	1.0

Source: Researchers' calculations based on NGS 2018.

Table A2: First stage ordered probit regression estimates for Table 2

(Dependent variable: Overall grade average)	
	Model 3
Highest education completed before in 2015 program	
(Reference group: Other/no previous PSE)	
Bachelor’s	-0.2897***
	(0.0358)
Master’s/Doctorate	-0.1968***
	(0.0613)
College	-0.0705**
	(0.0307)
Mother’s education level	
(Reference group: less than a high school diploma)	
High school diploma or its equivalent	-0.1263***
	(0.0422)
Trade certificate or diploma	0.0569
	(0.0550)
College/ CEGEP/ Other non-university certificate or diploma	-0.1436***
	(0.0442)
University below Bachelor’s/Bachelor’s degree	-0.1825***
	(0.0446)
University above the Bachelor’s/Master’s/Doctorate	-0.2456***
	(0.0552)
Father’s education level	
(Reference group: less than a high school diploma)	
High school diploma or its equivalent	-0.0823**
	(0.0394)
Trade certificate or diploma	-0.0377
	(0.0453)
College/ CEGEP/ Other non-university certificate or diploma	-0.0962**
	(0.0442)
University below Bachelor’s/Bachelor’s degree	-0.0711*
	(0.0414)
University above the Bachelor’s/Master’s/Doctorate	-0.0815*
	(0.0475)
Gender (Reference group: female)	
Male	0.1130***
	(0.0217)
Marital status	
(Reference group: single/separated/divorced/widowed)	
Married or living common-law	-0.0808***
	(0.0234)
Worked during enrollment (Reference group: No)	
Yes	-0.0627**
	(0.0255)

cont . . .

Table A2: First stage ordered probit regression estimate, continued

(Dependent variable: Overall grade average)	
Age (Reference group: less than 25 years old)	
25 to 29 years old at graduation	0.0581*
	(0.0305)
30 to 39 years old	-0.1167***
	(0.0354)
40 or more years old	-0.1558***
	(0.0431)
Level of study for 2015 program (Reference group: college)	
Bachelor's	0.1502***
	(0.0251)
Master's/Doctorate	-0.3735***
	(0.0400)
Pseudo R^2	0.032
Number of observations	15,063

Notes: Robust standard errors are in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels, respectively.

Table A3: Grade-earnings and work-earnings relationship by field of study

		Model 4
Education	A-range	0.1782
		(0.2207)
	B-range	0.1776
		(0.2164)
	Worked during enrollment	0.0266
		(0.0488)
	Number of obs.	1,234
	R^2	0.2385
Visual and performing arts and communications technologies	A-range	0.2351
		(0.1494)
	B-range	0.2728*
		(0.1437)
	Worked during enrollment	-0.0344
		(0.1057)
	Number of obs.	480
	R^2	0.0908
Humanities	A-range	0.0205
		(0.1200)
	B-range	0.0074
		(0.1137)
	Worked during enrollment	0.0765
		(0.0861)
	Number of obs.	579
	R^2	0.1159
Social and behavioural sciences and law	A-range	0.0986*
		(0.0508)
	B-range	0.1135**
		(0.0486)
	Worked during enrollment	0.0206
		(0.0374)
	Number of obs.	2,234
	R^2	0.1246
Business, management, and public administration	A-range	0.1777***
		(0.0412)
	B-range	0.0532
		(0.0397)
	Worked during enrollment	0.1072***
		(0.0250)
	Number of obs.	3,465
	R^2	0.2434

cont . . .

Table A3: Grade-earnings and work-earnings relationship, continued

Physical and life sciences and technologies	A-range	-0.0771
		(0.0959)
	B-range	0.0539
		(0.0815)
	Worked during enrollment	0.0311
		(0.0558)
	Number of obs.	816
	R^2	0.1088
Mathematics, computer and information sciences	A-range	0.1877***
		(0.0718)
	B-range	0.0389
		(0.0729)
	Worked during enrollment	-0.0051
		(0.0524)
	Number of obs.	606
	R^2	0.2024
Architecture, engineering and related technologies	A-range	0.1599***
		(0.0429)
	B-range	0.0694
		(0.0431)
	Worked during enrollment	0.0279
		(0.0274)
	Number of obs.	2,049
	R^2	0.1373
Health, parks, recreation and fitness	A-range	0.0294
		(0.0612)
	B-range	0.0255
		(0.0601)
	Worked during enrollment	0.0188
		(0.0314)
	Number of obs.	2,709
	R^2	0.1802
Other (agriculture, natural resources and conservation; personal, protective and transportation services)	A-range	0.1321*
		(0.0722)
	B-range	0.0660
		(0.0736)
	Worked during enrollment	0.1247**
		(0.0509)
	Number of obs.	891
	R^2	0.1294

Notes: Robust standard errors are in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. First-stage ordered probit results and full OLS results are available on request. The male dummy variable is also included since the samples are aggregated.