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The Long-term Labour Market Premiums Associated with a Terminal High School Diploma

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.   not available for any reference period
..   not available for a specific reference period
...   not applicable
0   true zero or a value rounded to zero
0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p} preliminary
^{r} revised
x   suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E} use with caution
F   too unreliable to be published
*   significantly different from reference category ($p < 0.05$)

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Acknowledgements

Table of contents

Abstract

This paper examines the long-term labour market premiums associated with a high school diploma. The focus is on the value of the qualification (the signaling effect), but the premiums associated with the number of years of schooling required to obtain the qualification (the human-capital effect) are also estimated. The labour market outcomes of individuals born in the mid-1960s are measured from their mid-20s to their mid-40s with longitudinal administrative data from the Longitudinal Worker File (LWF) that are linked to the 1991 Census of Population. Two groups are considered: terminal high school graduates (those who had obtained a high school diploma but had not acquired any postsecondary education by the 1991 Census) and individuals without a high school diploma (those who had no high school diploma, were not enrolled in high school, and had no postsecondary education at the time of the 1991 Census). The findings suggest that, after accounting for differences in the number of years of completed schooling and demographic characteristics, a high school diploma is associated with $83,000 to $123,000 in additional earnings for men and with $70,000 to $107,000 in additional earnings for women over the 20-year reference period. Men and women with a terminal high school diploma are covered by an employer-sponsored pension plan for about one additional year over the period. Furthermore, a high school diploma is associated with one to two additional years of employment for women. Finally, there is little evidence that a terminal high school diploma is associated with union membership or exposure to layoffs. The study also finds an important human-capital effect to staying in school. The average student with no high school diploma has 1.8 fewer years of schooling than does the average terminal high school graduate. The estimated value of completing those additional 1.8 years of schooling (without receiving the diploma) is about equivalent to obtaining the diploma itself.

Executive summary

Across Canada, various agencies offer programs that assist target populations in obtaining their high school diploma. This study utilizes newly available data to estimate the long-term, individual labour market premiums associated with completing high school. The focus is on the value of the qualification (the signaling effect), rather than the schooling required to obtain it (the human-capital effect), although both effects are estimated. The study also focuses on the value of a terminal high school diploma, not on its value as a gateway to a postsecondary education, although this value may be substantial since previous studies have associated a postsecondary education with superior labour market outcomes. However, many students at the margin of leaving high school early may not consider postsecondary studies in their decision-making process.

The labour market outcomes of individuals born in the mid-1960s are measured from their mid-20s to their mid-40s with longitudinal administrative data from the Longitudinal Worker File (LWF) that are linked to the 1991 Census of Population file. Two groups are considered: terminal high school graduates (those who had obtained a high school diploma but had not acquired any postsecondary education by the 1991 Census) and individuals without a high school diploma (those who had no high school diploma, were not enrolled in high school, and had no postsecondary education at the time of the 1991 Census). Given the richness of the LWF, several outcomes are examined, including wages and salaries, total earnings (wages and salaries plus net self-employment income), coverage by an employer-sponsored pension plan, employment, union membership, and permanent and temporary layoffs. All of these outcomes are measured over a twenty-year period. Outcomes reported in dollars are expressed in 2010 constant dollars. Other outcomes are expressed as counts (number of years) over the entire period.

The findings suggest that, after accounting for differences in the number of years of completed schooling and demographic characteristics, a high school diploma is associated with $83,000 to $123,000 in additional earnings for men and with $70,000 to $107,000 in additional earnings for women over the 20-year reference period. Men and women with a terminal high school diploma are also found to be covered by an employer-sponsored pension plan for about one additional year over the period. Finally, a high school diploma is associated with one to two additional years of employment for women. There is little evidence that a terminal high school diploma is associated with union membership or exposure to layoffs.

Overall, the results point to small, but non-negligible, pecuniary benefits to completing a high school diploma, even though individuals who pursued postsecondary schooling where excluded from the analysis. The results also lend support to a signaling effect in the labour market: the notion that, in the absence of reliable information on the skill set of workers, employers will view the completion of a high school diploma as a positive signal.

Although the focus of the study was the signaling effect of a high school diploma, the study did find a substantial human-capital effect of schooling. The average student with no high school diploma has 1.8 fewer years of schooling than does the average terminal high school graduate. The estimated value of completing those additional 1.8 years of schooling (without receiving the diploma) is about equivalent to obtaining the diploma itself.

Using an extraneous data set, the International Adult Literacy and Skills Survey (IALSS 2003), the main results of the study (the signaling effects on earnings) are confirmed even when direct skill measures are included in the model, along with parental education variables.

The study also sheds light on why U.S. studies (Heckman and LaFontaine 2006; Martorell and Clark 2010) have found no premiums associated with completing a high school diploma, while Canadian studies (Campolieti et al. 2009 and the current study) find that there are benefits to doing so. Specifically, the U.S. studies examine local average treatment effects that pertain to individuals on the margin of passing the requirements to complete high school. In contrast, the Canadian studies estimate average premiums, not only those experienced by marginal students. Moreover, quantile regression results suggest considerable variability in outcomes along the conditional distribution of earnings, and these may reconcile the Canadian and U.S. findings. Specifically, the premiums associated with a high school diploma are quite low for those at the bottom of the wage distribution and much higher for the rest of the distribution.

It is important to note that the results of this study apply to one particular cohort—individuals born in the mid-1960s who were successfully linked to administrative data. Although the cohort is largely representative of the broader population of individuals born in the mid-1960s, some differences may nevertheless exist. Moreover, long-term outcomes for more recent cohorts are not yet available, and may or may not display similar results.

A follow-up study will focus on the long-term labour market premiums associated with educational decisions made by high school graduates: entering the workforce immediately, or pursuing a college certificate or a bachelor's degree.

1   Introduction

Across Canada, various agencies offer programs that assist target populations in obtaining their high school diploma. Labour Market Development Agreements and Labour Market Agreements negotiated between the federal and provincial governments provide support for eligible low-skilled and unemployed adults to obtain their high school equivalency (e.g., Generalized Educational Development). After-school interventions have been implemented in many jurisdictions to reduce high school drop-out rates among at-risk youth (e.g., the Pathways to Education Program[1]), and in recent years compulsory school laws have been amended in some provinces with the same objective in mind.[2]

The private and public benefits associated with raising high school completion rates are both numerous and complex (Oreopoulos and Salvanes 2011). This study focuses on a single dimension—the long-term labour market premiums associated with a high school diploma. Comparisons are drawn between 'terminal high school graduates'—individuals who obtained a high school diploma but did not pursue further studies—and individuals who did not obtain a high school diploma. The central question is: "What are the long-term labour market premiums associated with completing versus not completing high school?" The role of high school graduation as a gateway to postsecondary studies and the labour market premiums associated with additional credentials are beyond the scope of the analysis.[3]

Labour economists have described the role that education plays in labour market outcomes from two competing perspectives (Weiss 1995). Human-capital theory predicts that individuals with more education will have better job prospects because their schooling has raised their skill level and because it is assumed that prospective employers will observe skill levels. According to this view, individuals who have completed all the requirements for a high school diploma would not benefit by adding the credential to their résumés, since it is years of schooling that contribute to skills and skills that determine labour market outcomes. A high school diploma, net of the years of education required to obtain it, is not expected to improve labour market prospects.

Signaling theory offers a competing view. The assumption here is that employers cannot observe the skills of workers and that instead they must use 'signals', such as high school diplomas, to screen job applicants. According to this view, additional schooling does not improve job prospects unless a credential is obtained. The credential may or may not be an accurate proxy for skills, but it is a proxy that employers may use. Workers with a diploma and workers without a diploma may *actually* have different skills, purely by selection. For example, those who completed their diploma may have done so because they have a tendency to complete tasks or an ability to pass written tests, while those who did not obtain their diploma may have better job search skills, interviewing skills, or social connections. Ideally, researchers should take into account as many observable skills and characteristics as possible when comparing high school graduates with non-graduates. Assuming that all relevant factors are taken into account (including years of schooling), any remaining difference in outcomes would be due to a signaling effect (i.e., perceived skill differences, net of actual differences in skills).

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1. See www.pathwaystoeducation.ca for more information.
2. Specifically, Ontario and New Brunswick. See Oreopoulos (2006) for evidence on the positive effects of raising the compulsory school age.
3. In reality, many high school graduates go on to pursue postsecondary qualifications. In this sense, high school graduation is very beneficial as it is a stepping-stone to further studies, which have been shown to be positively correlated with labour market outcomes. However, estimating the premiums associated with higher levels of schooling is beyond the scope of the current study. See Bourdabat et al. (2010) for evidence on the benefits of postsecondary qualifications.

When data on both years of schooling and credentials are available, researchers will often accommodate both human-capital and signaling theory in their analyses. For example, Ferrer and Riddell (2002) used the 1996 Census of Population to estimate the role of credentials in determining labour market outcomes, while accounting for years of schooling. They found that a high school diploma (perhaps coupled with a postsecondary qualification) raises annual earnings by 5% for men and by 6% for women.

However, Ferrer and Riddell's definition of high school graduates includes those who attended or graduated from a postsecondary program. This is a valid approach given that high school diplomas serve as a stepping-stone to postsecondary studies for many students. However, this may not be the case for those on the margin of deciding whether to graduate or not, and comparisons between terminal high school graduates and non-graduates may be more instructive.

The only Canadian study to adopt such an approach is Campolieti et al. (2010). The authors of that study identified the signaling effect of a high school diploma by instrumenting the decision to leave high school with local labour market conditions at the time students were in high school. They found that completing a high school diploma (without postsecondary) is generally positively associated with employment and wages at ages 22 to 24. Several U.S. studies have focused on an even more marginal population—those who barely met (or barely did not meet) the requirements for high school graduation. For example, Heckman and LaFontaine (2006) examined the wages of a sample of adults who, at some point in the past, wrote the Generalized Educational Development (GED) exam. Using test scores, they employed a regression discontinuity design to compare individuals who just barely passed the exam with those who just barely failed, arguing that the two groups are likely to be quite similar in the absence of the qualification. They found that the GED confers no benefits in terms of higher wages. Similarly, Martorell and Clark (2010) examined regular high school students in Florida and Texas, where high school exit exams are required for graduation. They too found no short-run benefits (six to seven years) to the successful completion of the exam.

To date, no Canadian study has examined the *long-term* labour market benefits associated with completing a high school diploma. This study addresses this issue by examining labour market outcomes of individuals born in the mid-1960s from their mid-20s to their mid-40s with longitudinal administrative data (the Longitudinal Worker File, or LWF) that are linked to the 1991 Census of Population file. Two groups are considered: terminal high school graduates (those who had obtained a high school diploma but had not acquired any postsecondary education by the 1991 Census) and individuals without a high school diploma (those who had no high school diploma, were not enrolled in high school, and had no postsecondary education at the time of the 1991 Census). The study also contributes to the literature by examining a broader range of labour market outcomes than has been considered in previous studies.

Findings from the current study indicate that, after accounting for differences in the number of years of completed schooling and demographic characteristics, a high school diploma is associated with $83,000 to $123,000 in additional earnings for men and with $70,000 to $107,000 in additional earnings for women over the 20-year reference period. Men and women with a terminal high school diploma are covered by an employer-sponsored pension plan for about one additional year over the period. A high school diploma is associated with one to two additional years of employment for women. There is little evidence that a terminal high school diploma is associated with union membership or exposure to layoffs.

Although the focus of the study is on the signaling effect of a high school diploma, the study also finds a substantial human-capital effect. The average student with no high school diploma has 1.8 fewer years of schooling than does the average terminal high school graduate. The estimated value of completing those additional 1.8 years of schooling (without receiving the diploma) is about equivalent to obtaining the diploma itself.

It is important to note that the results of this study apply to one particular cohort—individuals born in the mid-1960s who were successfully linked to administrative data. Although the cohort is largely representative of the broader population of individuals born in the mid-1960s, some differences may nevertheless exist. Moreover, long-term outcomes for more recent cohorts are not yet available, and may or may not display similar results.

The rest of the paper proceeds as follows. The data and methods used in this study are described in the next section, Section 2. The results are presented in Section 3. Finally, the study concludes with a discussion of the findings and some thoughts on future research.

2 Methodology

The main portion of this analysis relies on the linked 1991 Census–Longitudinal Worker File (LWF). The 1991 Census 2B (long-form) consists of a 20% random sample of Canadian households and contains a rich set of socio-economic variables. This file was linked to administrative health data[4] through a probabilistic link to the T1 (*T1 General - Income Tax and Benefit Return*) for individuals who were aged 25 or older on December 31, 1991. In total, about 75% of the sample was matched through this method, generating about a 15% sample of the population aged 25 or older.

The resulting file is then linked to the LWF through the Social Insurance Number. The LWF is a 10% random sample of individuals who received a T4 (*T4 - Statement of Remuneration Paid*) or filed a T1 (*T1 General - Income Tax and Benefit Return*). The file is constructed by Statistics Canada from four linked administrative files: the Record of Employment (ROE) files of Human Resources and Skills Development Canada; the T1 (*T1 General - Income Tax and Benefit Return*) and the T4 (*T4 - Statement of Remuneration Paid*) files of the Canada Revenue Agency; and the Longitudinal Employment Analysis Program (LEAP) of Statistics Canada. The data are longitudinal and span the period from 1983 to 2010. Once individuals enter the LWF, they remain as long as they can be observed in the files (i.e., as long as they file a T1 or receive a T4). For example, someone who has a paid job in 1996 and is selected in the LWF and does not work in 1997, and returns to the labour force in 1998 by becoming self-employed will appear in the LWF in 1996 and 1998. Analysts can then impute zero earnings from a paid job or self-employment in 1997.

The final 1991 Census–LWF file is about a 1.5% sample of the population aged 25 or older on December 31, 1991, for a total sample size of 263,674.[5] Each of the two files that make up the 1991 Census–LWF file has its own purpose in this study. The 1991 Census is used for selecting the analytical sample and for deriving the education and background characteristics. The sample consists of individuals born in a Canadian province in the mid-1960s (1964 to 1966). They were thus, on average, 26 years old in 1991 (and on average 45 years old in 2010). Multiple birth cohorts were necessary to achieve a reliable sample size. The final sample also had no more than a high school diploma and no postsecondary schooling at the time of the 1991 Census (June 4, 1991) and had not attended school in the previous nine months.

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4. Note that the health information garnered from the administrative files is not used in the current study.
5. However, the sample is not randomly generated because of the probabilistic nature of the linkage between the Census and the T1 files. The distribution of sex, age, province of residence, place of birth, and highest level of schooling is almost identical on the 1991 Census–LWF file and the 1991 Census file, but some groups are under-represented. For example, Wilkins et al. (2008) noted that Aboriginal people are under-represented in the linked file. For this reason, it is easier to draw inferences to the linked sample with unweighted data (as is done in this study) than to draw inferences to the original Census population with the sample weights. Nevertheless, weighted and unweighted results are qualitatively similar.

Respondents to the 1991 Census reported whether they had graduated from high school and how many years of elementary and secondary schooling they had obtained. This information is used to create a high school graduation dummy variable and a variable indicating the number of years of schooling. The survey also collected several important background characteristics, which are used to create the following variables in the analysis: a female dummy variable; a dummy variable indicating membership in a visible-minority group; an Aboriginal dummy variable; a dummy variable indicating French as the first official language spoken; a long-term disability dummy variable; and a series of province-of-birth dummy variables.[6] Year of birth dummy variables are also created to account for the three different birth cohorts.[7]

The LWF is also used for selecting the analytical sample. Specifically, individuals have to appear in the file in at least 18 years out of 20.[8] This criterion, along with those imposed on the 1991 Census file, led to a final analytical sample of 4,161 individuals. Of those, there were 1,843 terminal high school graduates (899 men and 944 women) and 2,318 non-graduates (1,169 men and 1,149 women).

The LWF file is also used to track several long-term labour market outcomes from 1991 to 2010,[9] including total earnings (wages and salaries plus net self-employment income), coverage by an employer-sponsored pension plan, employment, union membership, and permanent and temporary layoffs. The focus is outcomes or benefits acquired from participating in the labour market or working in a job. For example, employer contributions to a pension plan are of interest since they represent a fringe benefit to the employee. In contrast, employee contributions to a registered retirement savings plan (RRSP) are excluded since they represent, in part, a retirement planning decision of the worker.

Total earnings are monetary in nature and are measured over time. To account for inflation, dollar figures are denoted in 2010 constant dollars using the annual total Consumer Price Index, 2009 basket (CANSIM table 326-0021). To account for the time value of money (independent of inflation), total earnings are, at times, also expressed in present value terms (i.e., at the

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6. Recall that only individuals born in a Canadian province were retained in the sample. As a result, individuals who did not report French or English as the first official language were dropped from the analysis since as well there were too few cases to provide common support in the regressions. Individuals who were born in one of the territories were also dropped as a result of low sample sizes.
7. All of these variables are determined well before high school. As a result, they are not outcomes of the 'treatment' in question (high school graduation). Although factors such as industry, occupation, and labour market experience are likely to influence many labour market outcomes, they are themselves outcomes. High school graduates may work in different industries and occupations, and have more or less labour market experience than non-graduates. For this reason, such variables are excluded from the model.
8. Insisting that individuals remain in the LWF file for most years was necessary in order to avoid cases where people left Canada to work in a foreign country (where labour market outcomes cannot be observed and may be falsely coded to zero by default). This sample criterion led to only a 9.2% loss in sample size and yielded results similar to those yielded when no such restriction is imposed. A less stringent sampling criterion was also used to produce a separate set of results: individuals had to be present in the LWF at the beginning (1991) and end (2010) of the period. This measure led to a 7.3% sample loss, as compared to results obtained when no such restrictions are imposed; once again, the results were very similar.
9. Earlier years are not included since they may have preceded the completion of high school. All that is known is that the high school diploma was obtained by the date of the 1991 Census (June 4, 1991) and that individuals had not been in school in the previous nine months. It is possible that additional credentials were acquired after the 1991 Census, when individuals were older than 26 years old on average. Unfortunately, the data cannot help identify these cases.

beginning of the investment period).[10] Results obtained from using a 5% discount factor are shown.[11] However, the focus will be total earnings in current dollars (not present-value-adjusted). All non-dollar figure outcomes are simply sums over the period (i.e., the number of years a certain outcome applies).

A more detailed description of each outcome follows below:

Total cumulative earnings

- This is the sum of wages and salaries and net self-employment income before taxes and deductions.
- Wages and salaries represent earnings from paid jobs and appear on T4 slips.
- Net self-employment income is reported on the T1.
- Total cumulative earnings and their present value over the 20-year period (expressed in 2010 constant dollars) are used in the study.[12]

Coverage by an employer-sponsored pension plan

- Contributions to a pension plan—a deferred profit-sharing plan (DPSP) or a registered pension plan (RPP)—reported on T4 slips are entered in the pension adjustment box on the T1 form.[13]
- In the case of DPSPs, all contributions are made by the employer; however, RPP contributions are made by the employer and possibly the employee as well. For this reason, it is not possible to accurately measure employer contributions to pension plans.
- The total number of years that individuals are covered by an employer-sponsored pension plan is used in the study.

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10. Even in a world with zero inflation, a dollar earned today is generally worth more than a dollar earned later. There are at least two reasons for this. First, workers may invest the dollar earned today and accumulate capital appreciation. Alternatively, workers may prefer to spend the dollar earned today. In either case, the worker may 'discount' the dollar earned later since it cannot be invested or spent until it is earned. With discrete-data on time periods, the present value of a future dollar amount is obtained by dividing the future value by 1 plus the discount factor (r), all to the power n (the number of discounting periods elapsed since the beginning of the period), or $\$1/(1+r)^n$. Given the absence of information on time preferences, time indifference is usually assumed, and private discount factors are usually based on real rates of interest. Similarly, the future value of money earned today can be estimated by allowing the value to accrue at the assumed rate, which is achieved by multiplying the value by $(1+r)^n$. One intuitive way to think about present value is that it represents the lump-sum equivalent value of an investment decision if it were handed out today rather than over a lifetime. In the context of this paper, if a high school diploma is worth x dollars in present value, then completing the diploma yields benefits over an extended period of time that are equivalent to receiving x dollars at the beginning of the period, that is, when individuals are in their mid-20s in this study.
11. The adjusted closing price of the S&P/TSX Composite Index (which accounts for dividends and stock splits) rose from \$4,690 to \$13,443 between January, 1991 and December 2010 (http://ca.finance.yahoo.com/). When expressed in December 2010 dollars (using the all-items total Consumer Price index for Canada, retrieved from CANSIM table 326-0020), this corresponds to a 5.4% real annual increase. Note that the S&P/TSX Composite Index covers approximately 95% of the Canadian equities market and has been the primary market indicator for Canadian-based, Toronto Stock Exchange listed companies since 1977 (http://www.tmxmoney.com). Qualitatively similar findings are obtained when other discount factors are used, specifically 3% and 7%.
12. It may be argued that wages and salaries and net self-employment income are not equivalent. Specifically, self-employed individuals may deduct certain expenses that may in some instances have been incurred in any event (e.g., a room in a house that serves as an office during business hours, but is used for Internet surfing by family members at other times). Schuetze (2002) suggested that self-employed individuals are able to conceal income since there is no third party reporting income. Using expenditure data, he demonstrated that food consumption is higher for self-employed workers than for paid workers for a given level of reported income. He interprets those results as tax noncompliance among the self-employed. However, the results reported here follow patterns of wages and salaries very closely.
13. Either employer contributions to a pension plan are invested into a fund on behalf of employees, or employees may have some degree of flexibility in choosing the fund. In some instances, employees may qualify for an early lump-sum payment, which they could choose to invest or spend.

Employment

- Individuals are employed in a given year when their T4 wages and salaries are positive or their T1 net self-employment income amount is different from zero.
- The total number of years that individuals are employed over the 20-year period is used in the study.

Union membership

- Union membership is denoted by the presence of positive 'dues' on the T1 form (filled in with information included on the T4 slip).
- Dues on the T1 form include annual membership dues paid to a trade union or an association of public servants, professional membership dues (to a maximum amount) to maintain a professional status recognized by law, dues paid to a parity or advisory committee, ordered under provincial law, and professional or malpractice liability insurance premiums, if needed to maintain a professional status recognized by law.[14]
- This measure will miss individuals who are covered by a collective bargaining agreement but are not in a union. According to Statistics Canada's Labour Force Survey (LFS), approximately 8.5% of individuals covered by a collective bargaining agreement in 1997 (the earliest year that data were available) were not part of a union (Akyeampong 1997). In 2010, the proportion was 6.3% (Uppal 2011).
- The total number of years of union membership over the 20-year period is used in the study.

Permanent and temporary layoffs

- Canada's *Employment Insurance Act* and *Employment Insurance Regulations*[15] require employers to issue an ROE when an employee working in insurable employment has an interruption in earnings. The ROE indicates the reason for the work interruption or separation. The ROE can thus be used to identify workers who are laid off. It is possible to distinguish between workers who are temporarily or permanently laid off. Permanently laid off workers are those who do not return to the same firm during the 12 months following lay-off. All other lay-offs are classified as temporary.[16]
- The total numbers of permanent and temporary layoffs experienced over the 20-year period are used separately in the study.

In standard human-capital theory, individuals invest in schooling when the present value of the expected net monetary benefits of doing so is positive. The monetary benefits of pursuing more schooling refer to additional lifetime earnings, while the monetary costs include the direct and 'psychic' costs of attending school (i.e., tuition fees, if any, and the dissatisfaction of attending school, studying, and doing homework if students indeed feel this way), plus the 'opportunity costs' of doing so (i.e., the foregone earnings associated with being in school rather than working). In the human-capital framework, identifying costs is usually a challenge as a result of data limitations. However, in the signaling framework, the goal is to estimate the premiums associated with completing the qualification, holding the number of years of schooling constant. Hence, the costs of obtaining the certificate (not the additional schooling) are approximately zero. 'Psychic' costs may be slightly greater than zero if certain exams need to be passed. However, since students are in school for the same amount of time, direct costs and foregone

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14. The levels and trends in total dues in the LWF align closely with those of actual union dues in the Labour Force Survey (LFS). These results are available upon request.
15. Visit http://www.servicecanada.gc.ca/eng/ei/legislation/ei_act_entry_page.shtml for more details.
16. The levels and trends in permanent and temporary layoffs in the LWF align closely with those of the Labour Force Survey (LFS). See Morissette et al. (2013) for more details.

earnings are non-existent. Since this study focuses on the marginal benefits of obtaining a high school diploma, it may safely ignore any costs associated with this decision, which are likely close to zero in any event.

3   Results

To begin, Charts 1 and 2 show the unadjusted earnings profiles of men and women over the 20-year reference period. Throughout most of the period, the absolute earnings gap is slightly larger among men, but the relative gap is larger among women. In both cases, terminal high school graduates generally earn at least $5,000 more each year than non-graduates.

Chart 1

Mean total earnings by educational attainment — Men

Earnings (2010 constant dollars)
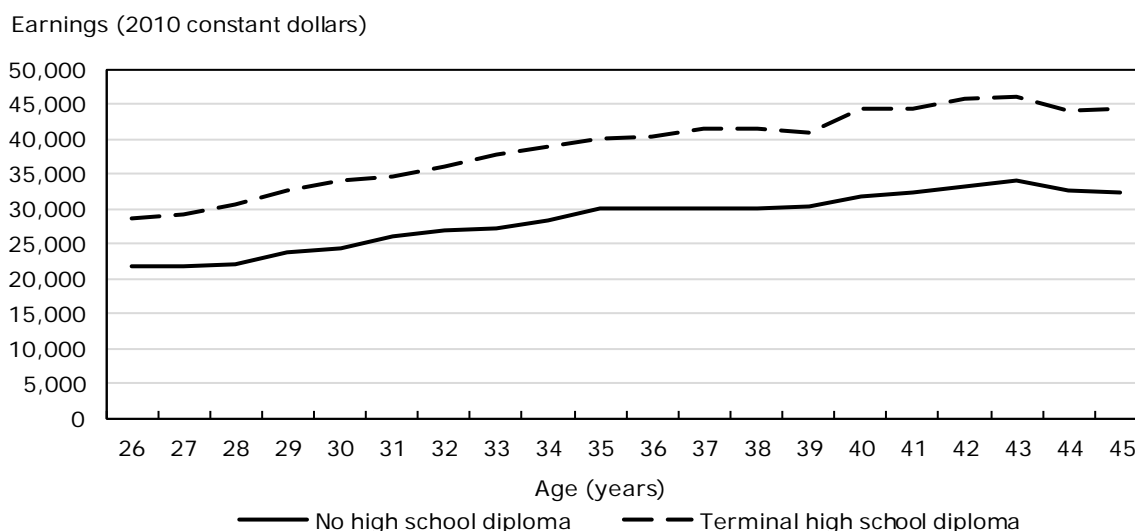
Notes: The sample consists of 2,068 men born in a Canadian province between 1964 and 1966 with no postsecondary studies and present in the Longitudinal Worker File (LWF) at least 18 of the 20 years from 1991 to 2010. Total earnings include wages and salaries and net self-employment income. The age represents the average age of the three cohorts in a given year. For example, age 26 refers to 1991, when individuals are 25 to 27.
Sources: Statistics Canada, 1991 Census of Population-Longitudinal Worker File, and CANSIM table 326-0021.

Chart 2
Mean total earnings by educational attainment — Women

Earnings (2010 constant dollars)

Age (years)

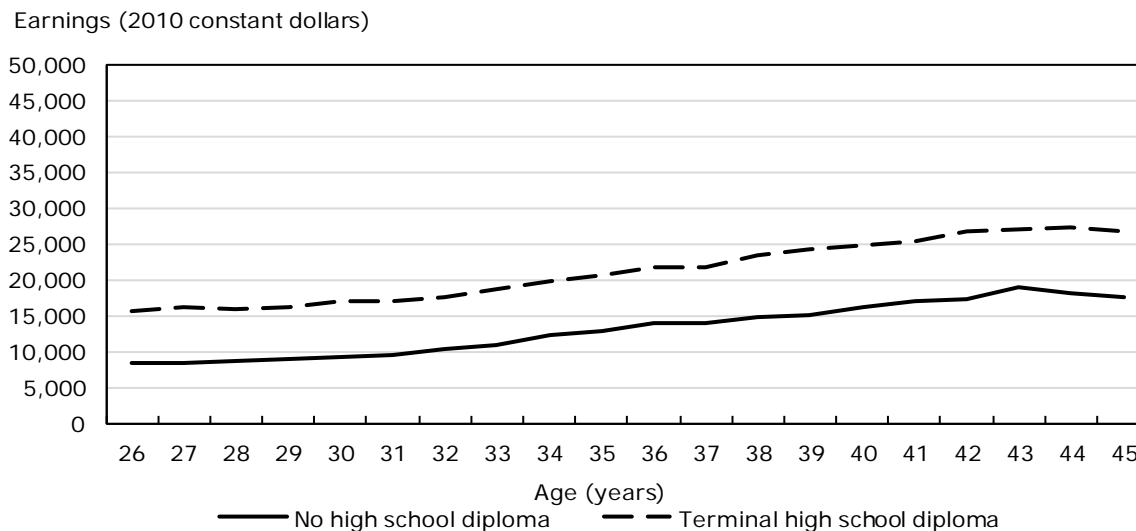——— No high school diploma   — — Terminal high school diploma

Notes: The sample consists of 2,093 women born in a Canadian province between 1964 and 1966 with no postsecondary studies and present in the Longitudinal Worker File (LWF) at least 18 of the 20 years from 1991 to 2010. Total earnings include wages and salaries and net self-employment income. The age represents the average age of the three cohorts in a given year. For example, age 26 refers to 1991, when individuals are 25 to 27.
Sources: Statistics Canada, 1991 Census of Population-Longitudinal Worker File, and CANSIM table 326-0021.

Summary measures of earnings and other outcomes over the reference period are presented in Table 1. For both men and women, they suggest that high school graduates fare better than non-graduates over the long-term, as indicated by higher average cumulative earnings, more years of pension coverage, more years of employment, and more years in unionized jobs. For men, completing a high school diploma is also associated with fewer permanent and temporary layoffs; the association, if any, is quite small among women.

Table 1

Mean long-term labour market outcomes by sex and educational attainment

	Men		Women	
	No high school diploma	Terminal high school diploma	No high school diploma	Terminal high school diploma
	2010 constant dollars			
Total cumulative earnings	570,114	775,937	262,755	424,150
Present value of total cumulative earnings	359,168	488,092	159,202	262,771
	number			
Years covered by an employer-sponsored pension plan	4.9	7.3	3.5	5.4
Years employed	17.2	18.9	13.3	16.5
Years in a union	5.4	6.8	3.3	4.1
Permanent layoffs experienced	2.2	1.5	0.9	0.7
Temporary layoffs experienced	4.6	3.7	2.0	2.2

Notes: The samples consist of 2,068 men and 2,093 women born in a Canadian province between 1964 and 1966 with no postsecondary studies and present in the Longitudinal Worker File (LWF) at least 18 of the 20 years from 1991 to 2010. Total earnings include wages and salaries and net self-employment income. Present values assume a 5% discount rate. All figures cover the period from 1991 to 2010.
Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

The raw differences in labour market outcomes presented in Table 1 do not take into account any socio-demographic differences between high school graduates and non-graduates and hence may be overstated. Compared to non-graduates, terminal high school graduates have about 1.8 more years of schooling, are less likely to be an Aboriginal person, are less likely to report a long-term disability, are less likely to have been born in Newfoundland and Labrador, and are more likely to have been born in Ontario (Table 2). All these characteristics are correlated with labour market outcomes.

Table 2
Sample characteristics by sex and educational attainment

	Men		Women	
	No high school diploma	Terminal high school diploma	No high school diploma	Terminal high school diploma
	mean			
Number of years of completed elementary and secondary schooling	10.2	12.0	10.2	12.1
	percent			
Member of a visible minority group	0.6	0.7	0.7	0.7
Aboriginal person	11.5	4.8	18.7	5.6
First official language learned and still understood is French	27.3	28.7	28.9	27.3
Has a long-term disability	5.1	1.7	4.8	2.6
Province of birth				
Newfoundland and Labrador	7.7	4.0	5.2	3.3
Prince Edward Island	1.0	0.4	0.5	0.4
Nova Scotia	5.9	3.6	3.6	3.7
New Brunswick	3.5	3.9	4.0	5.7
Québec	26.9	27.1	27.8	25.5
Ontario	25.1	37.6	26.5	34.7
Manitoba	7.5	5.2	8.1	5.4
Saskatchewan	7.8	4.1	7.7	3.8
Alberta	8.2	7.7	7.9	8.4
British Columbia	6.2	6.3	8.7	9.0
Year of birth				
1964	45.3	39.6	43.9	47.6
1965	38.8	43.0	41.3	36.7
1966	15.9	17.4	14.9	15.8

Note: The samples consist of 2,068 men and 2,093 women born in a Canadian province between 1964 and 1966 with no postsecondary studies and present in the Longitudinal Worker File (LWF) at least 18 of the 20 years from 1991 to 2010.
Source: Statistics Canada, 1991 Census of Population–Longitudinal Worker File.

When these differences are taken into account using regression analysis, the adjusted differences in outcomes (Table 3) become smaller than the raw differences presented above.[17] After controls for the aforementioned socio-demographic characteristics are applied, men with a high school diploma generally earn $83,000 more than men with no high school diploma. For women, the difference is $70,000. For both sexes, coverage by an employer-sponsored pension plan is higher among graduates, but only by about one additional year over the period. Men with a high school diploma generally experience slightly fewer permanent layoffs, while women with a high school diploma experience slightly more years of employment.

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17. For the outcomes measured in dollars, ordinary least squares regressions are estimated. All other outcomes are measured as counts. For this reason, negative binomial regressions models are estimated in those cases.

Table 3

Estimated relationship between outcome variables and high school certification — Regression results

	Men		Women	
	coefficient	standard error	coefficient	standard error
Outcome variable				
Total cumulative earnings	83,234 ***	23,044	69,587 ***	17,412
Present value of total cumulative earnings	50,259 ***	14,125	47,129 ***	10,272
Number of years covered by an employer-sponsored pension plan	1.016 **	0.384	0.882 [†]	0.349
Number of years employed	0.150	0.191	0.597 [†]	0.307
Number of years in a union	0.535	0.390	0.381	0.308
Number of permanent layoffs experienced	-0.353 *	0.171	-0.057	0.072
Number of temporary layoffs experienced	-0.321	0.391	0.267	0.263

*** significantly different from reference category (p<0.001)
** significantly different from reference category (p<0.01)
* significantly different from reference category (p<0.05)
[†] significantly different from reference category (p<0.10)
Notes: The samples consist of 2,068 men and 2,093 women born in a Canadian province between 1964 and 1966 with no postsecondary studies and present in the Longitudinal Worker File (LWF) at least 18 of the 20 years from 1991 to 2010. Total earnings include wages and salaries and net self-employment income. Dollar figures are expressed in 2010 constant dollars. Present values assume a 5% discount rate. All outcome variables cover the period from 1991 to 2010. All models include controls for the number of completed years of elementary and secondary schooling, membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province/territory of birth, and birth cohort. An ordinary least squares model is estimated when the outcome variable includes earnings. For other outcome variables, a negative binomial count model is estimated.
Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

The regression results also point to a substantial human-capital effect of schooling. Specifically, one additional year of schooling (at the elementary/secondary level) is worth $50,000 for men and $34,000 for women over the full period. Since the average non-graduate leaves school with about 1.8 years remaining, staying in school and completing all requirements for a high school diploma is estimated to yield an additional $175,000 in total earnings for men and an additional $131,000 in total earnings for women over the reference period. Approximately half of these benefits are due to a signaling effect, and approximately half are due to a human-capital effect.[18,19]

Table 4 shows the results from running a series of nearest neighbor matching estimators (Abadie et al. 2003). While regression models and matching estimators both account for differences in characteristics when the outcomes of graduates and non-graduates are compared, matching estimators do so in a much more detailed manner, finding the closest

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18. The total value of completing a high school diploma for a typical male who leaves with 1.849 years remaining is $49,888 multiplied by 1.849 (yielding the total human capital value), plus $83,234 (the signalling value), which yields $175,451. For a typical female who leaves with 1.819 years remaining, the total value is $33,682 multiplied by 1.819, plus $69,587, which yields $130,866.
19. Given the very real possibility of measurement errors in reporting years of schooling, this may lead to a downward bias in the human-capital effect. On the other hand, the opportunity cost (in the form of foregone earnings) is not included in this calculation, and this biases the estimate upwards. Since it is not possible to know which bias is stronger, the estimated human-capital effect is, at best, a rough estimate.

matches based on the similarity in characteristics.[20] Matching estimator results are qualitatively similar to the regression results presented in Table 3, with a few exceptions. First, earnings differences are approximately 50% larger with the matching estimators. In addition, with the matching estimator, a high school diploma is now positively associated with years of employment for men, and positively associated with years in a union for women.

Table 4

Estimated relationship between outcome variables and high school certification — Matching estimator results

	Men		Women	
	coefficient	standard error	coefficient	standard error
Outcome variable				
Total cumulative earnings	122,919 ***	24,273	107,120 ***	15,859
Present value of total cumulative earnings	75,849 ***	14,886	69,991 ***	9,870
Number of years covered by an employer-sponsored pension plan	0.912 *	0.389	1.059 ***	0.319
Number of years employed	0.889 ***	0.173	2.099 ***	0.266
Number of years in a union	0.511	0.401	0.867 **	0.306
Number of permanent layoffs experienced	-0.536 **	0.176	-0.057	0.070
Number of temporary layoffs experienced	-0.422	0.379	0.416	0.267

*** significantly different from reference category (p<0.001)
** significantly different from reference category (p<0.01)
* significantly different from reference category (p<0.05)
Notes: The samples consist of 2,068 men and 2,093 women born in a Canadian province between 1964 and 1966 with no postsecondary studies and present in the Longitudinal Worker File (LWF) at least 18 of the 20 years from 1991 to 2010. Total earnings include wages and salaries and net self-employment income. Dollar figures are expressed in 2010 constant dollars. Present values assume a 5% discount rate. All outcome variables cover the period from 1991 to 2010. All models include controls for the number of completed years of elementary and secondary schooling, membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province/territory of birth, and birth cohort. A nearest neighbour matching estimator is used.
Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

The regression and matching estimator results both indicate that the most robust (and perhaps empirically important) benefits associated with a terminal high school diploma are the additional earnings for both sexes and the greater coverage by employer-sponsored pension plans for men. Regression models and matching estimators both provide estimates of the average premiums associated with a terminal high school diploma, conditional on a set of characteristics. However, do the additional earnings apply equally across the earnings distribution? In other words, does having a high school diploma matter more for high or low earners, holding all else (that is observed) constant? Roughly speaking, higher earnings, conditional on a broad set of human-capital measures and other socio-economic characteristics, can be indicative of higher (unmeasured) skills in the labour market.

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20. Regression models simply estimate the (partial) correlation between characteristics and outcomes, and mechanically adjust differences in outcomes among graduates and non-graduates, assuming both groups held the same characteristics. In reality, both groups need not possess similar characteristics, and results may still be estimated without 'common support' (i.e., similarity in characteristics). Matching estimators are simply an effective tool for ensuring common support. Another benefit of a matching estimator is that it does not rely on functional form assumptions as in the case of a regression. Another popular type of matching estimator—propensity score estimators—requires common support in the form of propensity scores rather than specific covariates. It is important to note that matching estimators, much like regressions, account for selection on observables. Selection on unobservables may still be present in both cases. In other words, if there are unobservable reasons that determine selection into the treatment (completing a terminal high school diploma) and are correlated with the outcome, both approaches may lead to biased estimates.

To answer this question, a series of quantile regressions were estimated at various points of the conditional distribution of earnings.[21] The results are presented in Table 5. For both men and women, there is considerable heterogeneity in the association between earnings and high school graduation. A high school diploma pays off substantially more for those at the top of the conditional earnings distribution than for those at the bottom. Although not shown, the differences between the 95th and 5th percentiles for both men and women are statistically significant at 0.1% for men and at 5% for women.

Table 5

Estimated relationship between total cumulative earnings and high school certification — Quantile regression results

	Men		Women	
	coefficient	standard error	coefficient	standard error
Quantile				
5th	17,625 †	12,521	13,279 ***	1,413
10th	55,518 **	17,805	31,224 ***	5,007
25th	98,190 ***	23,710	46,202 ***	9,950
50th	96,367 ***	27,629	80,711 ***	13,498
75th	83,883 *	41,211	110,472 ***	19,553
90th	87,525 †	37,429	133,292 ***	36,406
95th	206,525 **	69,297	179,272 **	65,351

*** significantly different from reference category (p<0.001)
** significantly different from reference category (p<0.01)
* significantly different from reference category (p<0.05)
† significantly different from reference category (p<0.10)
Notes: The samples consist of 2,068 men and 2,093 women born in a Canadian province between 1964 and 1966 with no postsecondary studies and present in the Longitudinal Worker File (LWF) at least 18 of the 20 years from 1991 to 2010. Total earnings include wages and salaries and net self-employment income. Dollar figures are expressed in 2010 constant dollars. The analysis covers the period from 1991 to 2010. All models include controls for the number of completed years of elementary and secondary schooling, membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province/territory of birth, and birth cohort.
Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

One critique of the results presented so far is the possibility that high school graduates and non-graduates may possess different skills. Those who obtained their diploma may have done so because they have the ability to pass exams or have a strong sense of perseverance. Alternatively, those who did not obtain their diploma may have chosen this path because they have good networking skills, are highly motivated to earn money, or perform well in interviews.[22]

While the Census contains no information on either cognitive or non-cognitive skills, the 2003 International Adult Literacy and Skills Survey (IALSS) contains several measures of cognitive skills, including document and prose literacy, numeracy, and problem-solving. Additionally, the

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21. An ordinary least squares model estimates the mean of the dependent variable, conditional on various explanatory variables. A quantile regression is similar, except that specific conditional quantiles are estimated. Quantile regressions are useful here since a high school diploma may not be associated with the same premiums for all individuals. For example, those with lower skills may not be able to capitalize on their high school certification to the same extent as higher-skilled individuals.

22. Note that the quantile regression approach provides estimates across different skill levels within specific education groups (e.g., high school graduates). It does not account for differences in skills among different education groups.

file contains information on the education of respondents' parents—a factor that may be correlated with labour market outcomes.[23]

Using the IALSS, the analysis presented above is replicated as closely as possible, with measures of skill and parental education included as well. A few caveats must be noted at the outset. First, the IALSS analytical sample is somewhat different from the sample used above. It consists of 26- to 45-year-olds who were born in one of the ten Canadian provinces and who had no postsecondary education at the time of the survey. The wider age range (for a given year) is required in view of the smaller sample size (1,314). Second, men and women are pooled in the analysis, again for reasons of sample size. Third, the IALSS is limited with respect to labour market outcomes. Wages and salaries for the year 2002 (expressed in 2010 constant dollars here) are used. Fourth, the IALSS contains no measure of disability or visible-minority status.

First, differences in parental education and cognitive skills are examined. This shows that terminal high school graduates are more likely than non-graduates to have a parent with a postsecondary qualification (24% and 19%, respectively). It also shows that terminal high school graduates outperformed non-graduates on all four cognitive tests, with the differences ranging from 12% to 13% in all cases.

The next step is to add control variables, as was done in the 1991 Census–LWF analysis. In Table 6, three wage and salary models are estimated by ordinary least squares regression. The first model replicates the 1991 Census–LWF analysis as closely as possible. The base controls include the number of years of elementary and secondary schooling, age (and age squared in the regression), and dummy variables to indicate Aboriginal status, French as the first official language spoken and still understood, province of birth, and sex. The estimated earnings gap between high school graduates and non-graduates is about $5,800. In the second model, controls for paternal and maternal education are included. This reduces the difference slightly (to about $5,700). The third model incorporates quadratic terms for the four cognitive test scores. This measure has very little impact on the estimated earnings difference, which remains at about $5,700.[24]

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23. For example, more highly educated parents may facilitate employment opportunities through job contacts and networks. Corak and Piraino (2011) found that the intergenerational transmission of employers is positively related to paternal earnings.
24. Of the four cognitive measures, only numeracy has a statistically significant relationship with earnings.

Table 6

Estimated relationship between wages and salaries and high school certification — International Adult Literacy and Skills Survey (2003)

	Men and women combined	
	coefficient	standard error
Model 1 – Base controls	5,827 [†]	3,057
Model 2 – Model 1 controls plus paternal/maternal education	5,726 [†]	3,020
Model 3 – Model 2 controls plus document/prose literacy, numeracy, and problem-solving	5,697 [†]	3,041

[†] significantly different from reference category ($p<0.10$)
Notes: The sample consists of 1,314 individuals between the ages of 26 and 45 with no postsecondary studies. Wages and salaries are expressed in 2010 constant dollars. Ordinary least squares models are estimated. All models are pooled across men and women. The base controls include variables denoting years of schooling, sex, age, age squared, Aboriginal people, and first official language learned and still understood, and province of birth.
Source: Statistics Canada, International Adult Literacy and Skills Survey (2003).

The benefits associated with a high school diploma reported above add to the different results reported in the U.S. and Canadian literature. In the United States, Heckman and LaFontaine (2006) and Martorell and Clark (2010) found no benefits in terms of higher wages associated with a high school diploma while, in Canada, Campolieti et al. (2010), and now this study, find that there are monetary benefits to completing a high school diploma.

What might lie behind these divergent results? One possibility is the methodological differences between the U.S. and Canadian studies. Both U.S. studies (Heckman and LaFontaine 2006; Martorell and Clark 2010) use a regression discontinuity approach based on test scores around the minimum threshold required for graduation. While these results pertain to students at the margin of passing or failing the exam (i.e., they are local average treatment effects, or LATE), they may not necessarily apply to those further away from the threshold.

Both Canadian studies (Campolieti et al. (2010) and this one) adopt estimation approaches whose results are more likely to reflect average premiums associated with completing a high school diploma for all students, regardless of ability.[25] Campolieti et al. (2010) instrumented high school graduation with local labour market conditions while the students were in high school.[26] The current study attempts to validate the main regression results (ordinary least squares method, which estimates average premiums) with an extraneous dataset (IALSS 2003) that contains direct measures of cognitive skills.

One explanation that would be consistent with the different methodological approaches used and the results found in the U.S. and Canadian studies is that the premiums associated with completing a high school diploma increase with ability. Conceptually, higher-skilled high school graduates may be better positioned to effectively market their qualifications. For example, they may be more forward-thinking by seeking jobs in firms where a high school diploma provides more opportunities for advancement (as opposed to only higher starting wages).

Some of the results shown above are consistent with this possibility. In Table 5, the premiums associated with a terminal high school diploma are much lower at the bottom of the conditional earnings distribution than at the top. Although earnings and skills are positively correlated, this is only suggestive of a link.

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25. They still apply to students on the margin of obtaining a high school diploma (but no postsecondary education) since signalling effects are estimated for a sample that did not pursue postsecondary studies. However, within that group, the results reflect average premiums associated with a high school diploma for students across the ability spectrum.
26. Their results are also LATE, but in the sense that they apply to compliers (i.e., those who changed their decision about completing high school as a result of local labour market conditions).

A more direct test comes from the IALSS (2003), which contains direct skills measures. In a subsequent analysis, the mean of the four skills measures was used as a summary indicator, and respondents were divided into those in the top and bottom half of the skill distribution. Wage regressions identical to those in model 3 of Table 6 were then estimated for each group. The results clearly suggest that the premiums associated with a high school diploma are much larger at the top of the skill distribution ($11,700, significant at 5%) than at the bottom (-$900, not significant at 10%).

4   Conclusion

This paper examines the long-term labour market premiums associated with completing a high school diploma. The focus is on terminal high school diplomas—those not followed up with postsecondary schooling. In this sense, the study did not look at the value of a high school diploma as an entry point to postsecondary education, which may be substantial since previous studies have associated a postsecondary education with superior labour market outcomes. The study also focuses on the value of the high school diploma (i.e., the signaling value), as well as any additional years of schooling required to achieve it (i.e., the human-capital effect). The main contribution of the study is to provide long-term estimates on a wide range of labour market outcomes.

The labour market outcomes of individuals born in the mid-1960s are measured from their mid-20s to their mid-40s using longitudinal administrative data. A high school diploma is associated with $83,000 to $123,000 in additional earnings for men and with $70,000 to $107,000 in additional earnings for women over the 20-year reference period. Men and women with a terminal high school diploma are covered by an employer-sponsored pension plan for about one additional year over the period. Finally, a high school diploma is associated with one to two additional years of employment for women. There is little evidence that a terminal high school diploma is associated with union membership or exposure to layoffs.

In addition to the signaling effect of a high school diploma, there is also a substantial human-capital effect. The average student with no high school diploma has 1.8 fewer years of schooling than does the average terminal high school graduate. The estimated value of completing those additional 1.8 years of schooling (without receiving the diploma) is about equivalent to obtaining the diploma itself.

Using an extraneous data set (IALSS 2003), the main results of the study (the signaling effects of earnings) are confirmed even when direct skill measures are included in the model, along with parental education variables.

The study also sheds light on why U.S. studies (Heckman and LaFontaine 2006; Martorell and Clark 2010) have found no premiums associated with completing a high school diploma, while Canadian studies (Campolieti et al. 2009 and the current study) find that there are benefits to doing so. Specifically, the U.S. studies examine local average treatment effects that pertain to individuals on the margin of passing the requirements to complete high school. In contrast, the Canadian studies estimate average premiums, not only those experienced by marginal students. Moreover, quantile regression results suggest considerable variability in outcomes along the conditional distribution of earnings, and these may reconcile the Canadian and U.S. findings. Specifically, the premiums associated with a high school diploma are quite low for those at the bottom of the wage distribution and much higher for the rest of the distribution.

It is important to note that the results of this study apply to one particular cohort—individuals born in the mid-1960s who were successfully linked to administrative data. Although the cohort is largely representative of the broader population of individuals born in the mid-1960s, some differences may nevertheless exist. Moreover, long-term outcomes for more recent cohorts are not yet available, and may or may not display similar results.

A follow-up study will focus on the long-term labour market premiums associated with the educational decisions made by high school graduates: entering the workforce immediately, or pursuing a college certificate or a bachelor's degree.

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