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An Investment of a Lifetime? The Long-term Labour Market Premiums Associated with a Postsecondary Education

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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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Marc Frenette
Statistics Canada

Acknowledgements

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Abstract

This paper examines the long-term labour market premiums associated with completing a college certificate and a bachelor's degree, compared to completing a high school diploma. Several labour market outcomes of individuals are examined with longitudinal data over a 20-year period spanning their mid-30s to their mid-50s. The findings show that individuals who have a bachelor's degree or a college certificate have more favourable labour market outcomes over their working lives than individuals who have only a high school diploma. More specifically, the earnings premium associated with a bachelor's degree over the 20-year period ranges, on average, from $728,000 for men to $442,000 for women. For a college certificate, the premium is $248,000 for men and $180,000 for women, on average. The earnings premium associated with a bachelor's degree is much larger at the top of the distribution for men than it is for women. The study also finds that, for both men and women, a bachelor's degree and a college certificate are associated with more years of coverage in an employer-sponsored pension plan and fewer layoffs than a high school diploma.

Executive summary

For many individuals, a postsecondary education represents one of the largest investments made in a lifetime. However, longitudinal estimates of the long-term individual benefits of Canadian postsecondary investments simply do not exist given data constraints.

With the creation of a new linked file consisting of the 1991 Census of Population and the Longitudinal Worker File (LWF), it is now possible to follow individuals in the labour market for a longer period of time than is feasible with existing survey data. The purpose of this study is to compare labour market outcomes of individuals with different levels of educational attainment over a 20-year period spanning their mid-30s to their mid-50s. Three levels of education are considered, corresponding to the decisions made by students following high school graduation: no post-secondary studies, a college certificate, and a bachelor's degree. Longitudinal data are used to track total earnings (wages and salaries plus net self-employment income), coverage in an employer-sponsored pension plan, employment, union membership, and permanent and temporary layoffs over the period 1991 to 2010.

The findings show that individuals who have a bachelor's degree or a college certificate have more favourable labour market outcomes over their working lives than individuals who have only a high school diploma. More specifically, the earnings premium associated with a bachelor's degree over the 20-year period ranges, on average, from $728,000 for men to $442,000 for women. For a college certificate, the premium is $248,000 for men and $180,000 for women, on average. The earnings premium associated with a bachelor's degree is much larger at the top of the distribution for men than it is for women. This is the result of a much larger premium for men in the private sector than in the public sector and the higher likelihood of women working in the public sector than in the private sector. Within the public sector, the earnings premium associated with a bachelor's degree is larger for women at the top of the distribution than it is for men. The study also finds that, for both men and women, a bachelor's degree and a college certificate are associated with more years of coverage in an employer-sponsored pension plan and fewer layoffs than are associated with a high school diploma.

Using an extraneous data set (International Adult Literacy and Skills Survey 2003), the main earnings results of the study are confirmed in a qualitative sense even when direct skill measures are included in the model along with parental education variables. However, the earnings premiums decline by about one-third.

The results of this study apply to one particular cohort. Long-term outcomes for more recent cohorts are not yet available, and may or may not be similar to those in this study. Furthermore, causal relationships should not be inferred throughout the study.

1   Introduction

For many individuals, a postsecondary education represents one of the largest investments made in their lifetime. In deciding whether to pursue a postsecondary education, students consider the costs and benefits of attending. The costs may include those of a direct nature (e.g., tuition and other fees, textbooks), foregone earnings while in school, and 'psychic costs' (e.g., the stress of writing exams). While psychic benefits are also possible (e.g., making new friends, attending social events), a major component of the benefits of postsecondary are the labour market premiums associated with attending.

A major challenge in establishing estimates of the premiums associated with postsecondary education is the fact that graduates draw these premiums over several years as they capitalize on their investments in the labour market. Until now, attempts to estimate the lifetime premiums have primarily focused on cross-sectional data, which requires strong assumptions.[1,2] A less ambitious, but perhaps more feasible, research objective consists of simply reporting differences in earnings by educational level at a point in time or across several points in time (but not over a career). For example, Boudarbat et al. (2010) used Census files from 1980 to 2005 to track the evolution of the premiums associated with human capital in Canada.

With the creation of a new linked file that includes the 1991 Census of Population and the Longitudinal Worker File (LWF), it is now possible to follow individuals in the labour market for a longer period of time than is feasible with existing survey data. The purpose of this study is to compare labour market outcomes of individuals with different levels of educational attainment over a 20-year period spanning their mid-30s to their mid-50s. Three levels of education are considered, corresponding to a first set of decisions made by students following high school graduation: no post-secondary studies, a college certificate, and a bachelor's degree.[3] The LWF file is used to track several long-term labour market outcomes from 1991 to 2010, including total earnings (wages and salaries plus net self-employment income), coverage in an employer-sponsored pension plan, employment, union membership, and permanent and temporary layoffs.

The findings show that individuals who have a bachelor's degree or a college certificate have more favourable labour market outcomes over their working lives than individuals who have only a high school diploma. More specifically, the earnings premium associated with a bachelor's degree over the 20-year period ranges, on average, from $728,000 for men to $442,000 for women. For a college certificate, the premium is $248,000 for men and $180,000 for women, on average. The earnings premium associated with a bachelor's degree is much larger at the top of the distribution for men than it is for women. This is the result of a much larger premium for men in the private sector than in the public sector and the higher likelihood of women working in the public sector than in the private sector. Within the public sector, the earnings premium associated with a bachelor's degree is larger for women at the top of the distribution than it is for men. The study also finds that, for both men and women, a bachelor's degree and a college

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1. Using linked administrative data from the University Student Information System (USIS) and the T1 (*T1 General - Income Tax and Benefit Return*) files, Heisz (2001, 2003) tracked the earnings of bachelor's degree graduates for up to 23 years after graduation. However, incomplete coverage in most provinces limited the analysis to graduates of universities in British Columbia.
2. For example, Usher (2005) used a single cross-section to estimate lifetime earnings, which requires one to assume that earnings trajectories of different cohorts are identical in order to draw conclusions about lifetime earnings.
3. The 1991 Census of Population only contained a category for a trades certificate. As such, it does not separately identify registered apprentices, who may be grouped with other (unknown) educational categories. For this reason, the trades are not examined in this study. Also, see recent work by Frenette (2013), who estimated the long-term labour market premiums associated with completing a terminal high school diploma using the same data as in the current study.

certificate are associated with more years of coverage in an employer-sponsored pension plan and fewer layoffs than a high school diploma.

Using an extraneous data set (International Adult Literacy and Skills Survey 2003) that includes measures of skill and parental education, the main earnings results of the study are confirmed, although the inclusion of these additional covariates reduces the earnings premiums associated with a university degree or a college certificate by about one-third.

The results of this study apply to one particular cohort. Long-term outcomes for more recent cohorts are not yet available, and may or may not be similar to those in this study. Furthermore, causal relationships should not be inferred throughout the study.

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 appear in Section 3. Finally, the study concludes with a summary of the main findings, in Section 4.

2   Methodology[4]

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[5] through a probabilistic link to the T1 (T1 *General - Income Tax and Benefit Return*) personal income tax returns for individuals who were aged 25 or older on December 31, 1991. In total, about 75% of the Census 2B sample was matched through this method, generating a 15% sample of the population aged 25 and above.

The resulting file was then linked to the LWF. The LWF is a 10% random sample of individuals who received a T4 (T4 - *Statement of Remuneration Paid*) slip or filed a T1 return. The LWF 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 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 return or they receive a T4 slip). For example, if someone has a paid job in 1996 and is selected in the LWF, then does not work in 1997, and returns to the labour force in 1998 by becoming self-employed, that person will appear in the LWF in 1996 and 1998. Analysts can impute no 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.[6] 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 between 1955 and 1957. They were thus, on average, 35 years old in 1991 (and on average 54 years old in 2010). Multiple birth

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4. The methods and data are similar to Frenette (2013); thus, much of the description repeats itself. However, some key differences exist regarding sample selection and model specification.
5. The health information garnered from administrative files is not used in the current study.
6. 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.

cohorts were necessary in order to achieve a reliable sample size. At the time of the 1991 Census (June 4, 1991), the final sample also had a high school diploma, a college certificate, or a bachelor's degree.[7] These correspond to a first set of educational/career choices available to high school graduates.[8] Graduate and professional studies are options available to bachelor's degree graduates and, thus, are not examined in this study. Individuals had also not attended school in the nine months prior to the 1991 Census.

The survey also collected several important background characteristics, which are used to create the following variables in the analysis: a female dummy (binary) 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.[9] Year-of-birth dummy variables are also created to account for the three different birth cohorts.[10]

The LWF is also used for selecting the analytical sample. Specifically, individuals had to appear in the file in at least 18 years out of 20.[11] This criteria, along with those imposed on the 1991 Census file, led to a final analytical sample of 7,951 individuals. Of those, there were 4,053 high school graduates (1,714 men and 2,339 women), 2,405 college graduates (963 men and 1,442 women), and 1,493 bachelor's degree graduates (764 men and 729 women).

Several long-term labour market outcomes measured over the period from 1991 to 2010 are tracked with the LWF.[12] These include total earnings (wages and salaries plus net self-employment income), coverage in an employer-sponsored pension plan, employment, union membership, and permanent and temporary layoffs. The focus is on 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 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.

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7. The 1991 Census only contained a category for a trades certificate. As such, it does not separately identify registered apprentices, who may be grouped with other (unknown) educational categories. For this reason, the trades are not examined in this study.
8. The 1991 Census questionnaire prompted respondents to include an LLB (bachelor of laws) degree along with other bachelor's degrees. Since an LLB is normally undertaken as a second degree, all those whose major field of study was "law" were dropped from the analysis. Some of those cases may have been non-LLB legal studies graduates. Unfortunately, there is no way to distinguish between LLB and non-LLB law graduates. However, this exclusion resulted in only a 6% sample loss for men and a 3% sample loss for women. Furthermore, the results were very similar with or without law graduates.
9. 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 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.
10. All of these variables are determined well before high school. As a result, they are not outcomes of the 'treatment' in question (i.e., educational attainment). Although factors such as industry, occupation, and labour market experience are likely to influence many labour market outcomes, they are also potential outcomes of educational attainment. For this reason, such variables are, for the most part, excluded from the model (see Table 9 for an exception).
11. Insisting that individuals remain in the LWF file for most years was a necessary attempt 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).
12. Earlier years are not included since they may have preceded the completion of high school or postsecondary qualifications. It is known only that the education was completed 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 35 years old on average. Unfortunately, the data cannot help identify these cases. Note that, in Frenette (2013), terminal high school graduates were compared to those without a high school diploma between the ages of 26 and 45. An older cohort is examined in the current paper since adult learners are more likely to already have postsecondary qualifications. In other words, selecting an older cohort is necessary in this study as it reduces the probability that individuals pursued further studies after 1991.

Some of the outcomes are monetary in nature and are incurred 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), the monetary outcomes are, at times, also expressed in present-value terms (i.e., at the beginning of the investment period), with a 5% discount factor.[13] However, the main focus will be on the results in constant dollars (not present-value-adjusted, but inflation adjusted). The non-monetary outcomes are expressed as counts over the entire period (e.g., the number of years covered by an employer-sponsored pension plan).

A more detailed description of each outcome follows below:

Total cumulative earnings

- Total earnings are the sum of wages and salaries and net self-employment income.
- Wages and salaries represent earnings from paid jobs and appear on the T4 slips.
- Net self-employment income is reported in the T1 return.
- Total cumulative earnings and its present value over the 20-year period (expressed in 2010 constant dollars) are used in this study.[14,15]

Number of years covered by an employer-sponsored pension plan

- Contributions to a pension plan—a deferred profit-sharing plan (DPSP) or a registered pension plan (RPP)—are entered in the pension adjustment box on the T1 return by using the value entered on the T4 slip.[16]
- 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 of coverage by an employer-sponsored pension plan is used in this study.

Number of years employed

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

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13. The adjusted closing price of the Standard and Poor's (S&P)/Toronto Stock Exchange (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 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 TSX-listed companies since 1977 (http://www.tmxmoney.com). Qualitatively similar findings are obtained when other discount factors are used, namely 3% and 7%.

14. Total earnings provide a more complete picture of labour market success than wages and salaries alone. However, it can be argued that wages and salaries reflect returns to human capital, while net self-employment income may reflect returns to both human and financial or physical capital. It may also be argued that wages and salaries and net self-employment income are not equivalent. However, the patterns for total earnings reported here follow the (unreported) patterns of wages of salaries very closely.

15. In deriving total annual earnings, wages and salaries are top-coded to $1,000,000 in 2010 constant dollars. This is to account for outliers in the data.

16. 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 can choose to invest or spend.

Number of years in a union

- Union membership is denoted by the presence of positive 'dues' on the T1 return (filled in with information entered on the T4 slip).
- Dues on the T1 return 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 in order to maintain a professional status recognized by law.[17]
- 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 this study.

Number of permanent and temporary layoffs experienced

- Canada's *Employment Insurance Act* and *Employment Insurance Regulations*[18] require employers to issue a 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 laid off and workers who are 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.[19]
- The total numbers of permanent and temporary layoffs experienced over the 20-year-period are used separately in this study.

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17. The levels and trends in total dues in the LWF align closely with those of union membership reported in the Labour Force Survey (LFS). These results are available upon request.
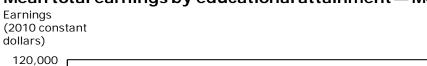18. Visit http://laws-lois.justice.gc.ca/eng/acts/E-5.6/ and http://laws-lois.justice.gc.ca/eng/regulations/SOR-96-332/ for more details.
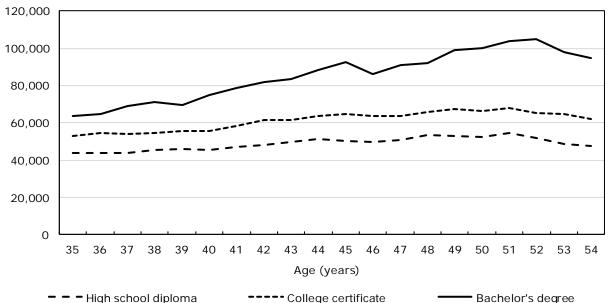19. The levels and trends in permanent and temporary layoffs in the LWF align closely with those of the LFS. See Morissette et al. (2013) for more details.

3   Results

Chart 1 shows mean annual earnings of men over the 20-year period by level of educational attainment. At age 35, earnings of men are highest among bachelor's degree graduates ($64,000), followed by college graduates ($53,000) and high school graduates ($44,000).

Chart 1
Mean total earnings by educational attainment — Men

Earnings
(2010 constant
dollars)

Notes: The sample consists of 3,441 men born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law), and are 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 35 refers to 1991, when individuals are 34 to 36.
Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

At the end of the period, when these men are 54 years old, bachelor's degree graduates earn about twice as much as high school graduates annually ($95,000 and $47,000, respectively). College graduates also earn substantially more than high school graduates at this point ($62,000 annually).

The differences in earnings by education among women in their mid-30s are about as large as men at this point (Chart 2). However, these differences do not increase as quickly over time as those for men. At the beginning of the period (age 35), bachelor's degree graduates earned almost twice as much as high school graduates ($37,000 compared to $20,000). College graduates also earned considerably more than high school graduates ($28,000).

By the end of the period, when these women are 54 years old, the earnings gap has not changed very much in relative terms. Specifically, bachelor's degree graduates earn $56,000 annually, which is again about twice as much as high school graduates ($28,000). College graduates earn $38,000.

Chart 2
Mean total earnings by educational attainment — Women

Earnings
(2010 constant
dollars)

Age (years)

- - - High school diploma ----- College certificate —— Bachelor's degree

Notes: The sample consists of 4,510 women born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law), and are 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 35 refers to 1991, when individuals are 34 to 36.
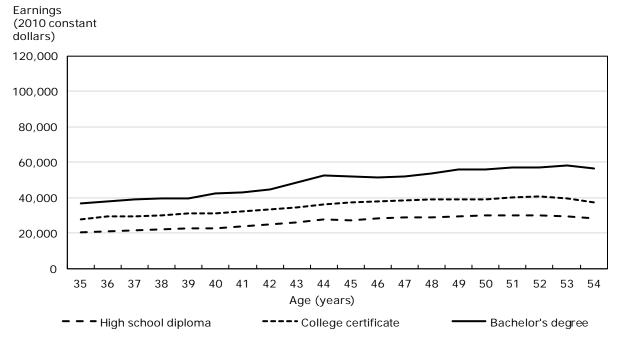**Sources:** Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

Summary measures of earnings and other outcomes over the 20-year period are presented in Table 1. As was evident in Charts 1 and 2, university and college graduates earned considerably more than high school graduates over the 20 years. This is especially the case for a bachelor's degree, which is associated with $732,000 in additional earnings for men and $448,000 in additional earnings for women.[20] Although the gap is larger among men in absolute terms, it is actually larger among women in relative terms. Specifically, men with a bachelor's degree earn 1.75 times as much as men with a high school diploma. For women, the ratio is 1.85.

The additional earnings associated with a bachelor's degree accrue over a 20-year period. Although these figures account for inflation, they do not account for foregone investment opportunities resulting from not receiving all of the additional earnings at the beginning of the period. The present values of these amounts, which are equivalent to receiving the additional earnings as a lump sum at the beginning of the period (assuming a 5% discount rate), are $443,000 for men and $279,000 for women (Table 1).

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20. These figures are simply the differences in total earnings between bachelor's degree graduates and high school graduates in Table 1. They do not account for differences in important socio-economic characteristics that may determine earnings. Later, regression results will be shown that do account for such differences.

Table 1

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

	Men			Women		
	High school diploma	College certificate	Bachelor's degree	High school diploma	College certificate	Bachelor's degree
	2010 constant dollars					
Total cumulative earnings	975,323	1,222,334	1,707,340	524,627	703,817	972,869
Present value of total cumulative earnings	628,364	783,599	1,071,624	331,373	445,923	610,516
	number					
Years covered by an employer-sponsored pension plan	9.5	11.0	10.7	7.2	9.6	11.5
Years employed	18.8	19.1	19.0	17.2	17.8	18.5
Years in a union	7.6	8.0	8.2	5.0	9.1	10.8
Permanent layoffs experienced	0.9	0.8	0.4	0.6	0.4	0.3
Temporary layoffs experienced	2.6	1.5	0.5	2.0	1.5	1.1

Notes: The samples consist of 3,441 men and 4,510 women born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law) and who are 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.

College graduates also earn far more than high school graduates over the 20-year period, but the differences are more moderate ($247,000 for men and $179,000 for women).

Holders of a college certificate or a bachelor's degree also benefit in other ways compared to high school graduates over the long-term. For both men and women, pension plan coverage and employment stability (i.e., fewer layoffs experienced) are greater among those with a college certificate or a bachelor's degree. Among women, the rate of union membership is greater among those with a college certificate or a bachelor's degree.

The raw differences in labour market outcomes presented in Table 1 do not take into account any socio-demographic differences between individuals with different levels of educational attainment. Results in Table 2 suggest that these differences are often substantial. Given that many of the characteristics examined in Table 2 are correlated with labour market outcomes, it is important to take these differences into account when comparing long-term labour market outcomes by educational attainment.

Table 2

Sample characteristics by sex and educational attainment

	Men			Women		
	High school diploma	College certificate	Bachelor's degree	High school diploma	College certificate	Bachelor's degree
	percent					
Member of a visible-minority group	0.6	1.5	2.4	0.9	0.8	1.6
Aboriginal person	3.3	3.8	1.3	4.1	3.9	2.2
First official language learned and still understood is French	32.0	31.2	28.7	31.4	26.2	24.4
Has a long-term disability	2.9	3.6	2.0	2.3	3.0	1.6
Province of birth						
Newfoundland and Labrador	2.1	2.1	1.8	2.7	2.8	1.5
Prince Edward Island	0.6	0.4	0.7	0.6	0.8	1.6
Nova Scotia	3.4	3.7	5.4	2.9	4.6	5.5
New Brunswick	4.4	2.6	2.4	4.1	3.1	2.3
Quebec	31.7	30.3	31.5	29.3	27.3	27.0
Ontario	33.4	35.0	33.0	32.4	35.0	32.6
Manitoba	4.3	5.3	5.2	4.5	4.9	5.2
Saskatchewan	5.5	4.5	4.8	5.2	5.7	5.9
Alberta	6.1	9.8	8.4	8.3	7.7	10.3
British Columbia	8.4	6.3	6.8	9.8	8.2	8.0
Year of birth						
1955	35.1	32.5	33.1	33.8	32.2	31.4
1956	33.7	31.6	32.3	32.2	33.4	33.6
1957	31.2	35.9	34.6	34.1	34.4	35.0

Note: The samples consist of 3,441 men and 4,510 women born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law) and who are 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.

The adjusted differences in outcomes follow from regression analysis and are shown in Table 3 (men) and Table 4 (women).[21] For the most part, the regression results qualitatively mirror the descriptive results. The earnings premium associated with a bachelor's degree over the 20-year period ranges from $728,000 for men to $442,000 for women. For a college certificate, the premium is $248,000 for men and $180,000 for women. For both men and women, a bachelor's degree and a college certificate are associated with more years of coverage in an employer-sponsored pension plan and fewer layoffs than a high school diploma. For women, a bachelor's degree and a college certificate are also associated with more years of employment and union membership.

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

Table 3

Estimated relationship between outcome variables and educational attainment for men — Regression results

	College certificate		Bachelor's degree	
	coefficient	standard error	coefficient	standard error
Outcome variable				
Total cumulative earnings (2010 constant dollars)	248,066 ***	30,600	728,717 ***	62,364
Present value of total cumulative earnings (2010 constant dollars)	156,883 ***	18,759	441,552 ***	37,503
Number of years covered by an employer-sponsored pension plan	2.534 ***	0.554	2.313 ***	0.609
Number of years employed	0.378 ***	0.113	0.196	0.124
Number of years in a union	0.425	0.456	1.162 *	0.500
Number of permanent layoffs experienced	-0.191 ***	0.051	-0.356 ***	0.052
Number of temporary layoffs experienced	-0.755 ***	0.127	-1.202 ***	0.132

*** significantly different from reference category (p<0.001)

* significantly different from reference category (p<0.05)

Notes: The samples consist of 3,441 men born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law) and who are 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 outcome variables cover the period from 1991 to 2010. All models include controls for membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province 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. In all cases, the omitted educational attainment category is high school completion.

Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

Table 4

Estimated relationship between outcome variables and educational attainment for women — Regression results

	College certificate		Bachelor's degree	
	coefficient	standard error	coefficient	standard error
Outcome variable				
Total cumulative earnings (2010 constant dollars)	180,413 ***	15,143	441,971 ***	31,261
Present value of total cumulative earnings (2010 constant dollars)	115,615 ***	9,575	275,864 ***	19,249
Number of years covered by an employer-sponsored pension plan	3.582 ***	0.446	6.905 ***	0.662
Number of years employed	0.776 ***	0.161	1.299 ***	0.180
Number of years in a union	5.921 ***	0.456	9.136 ***	0.763
Number of permanent layoffs experienced	-0.128 ***	0.028	-0.209 ***	0.031
Number of temporary layoffs experienced	-0.297 **	0.099	-0.536 ***	0.116

*** significantly different from reference category (p<0.001)

** significantly different from reference category (p<0.01)

Notes: The samples consist of 4,510 women born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law) and who are 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 outcome variables cover the period from 1991 to 2010. All models include controls for membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province 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. In all cases, the omitted educational attainment category is high school completion.

Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

The results are qualitatively similar in Table 5 (men) and Table 6 (women), where a nearest neighbour matching estimator is applied (Abadie et al. 2003). While regression models and matching estimators both account for differences in characteristics in comparing the outcomes of graduates and non-graduates, matching estimators do so in a much more detailed manner, finding the closest matches based on the similarity in characteristics.

Table 5

Estimated relationship between outcome variables and educational attainment for men — Matching estimator results

	College certificate		Bachelor's degree	
	coefficient	standard error	coefficient	standard error
Outcome variable				
Total cumulative earnings (2010 constant dollars)	242,606 ***	31,620	718,029 ***	66,936
Present value of total cumulative earnings (2010 constant dollars)	152,602 ***	19,248	436,415 ***	40,339
Number of years covered by an employer-sponsored pension plan	1.452 ***	0.344	1.357 ***	0.377
Number of years employed	0.357 **	0.114	0.196	0.141
Number of years in a union	0.408	0.340	0.918 *	0.379
Number of permanent layoffs experienced	-0.098	0.135	-0.524 ***	0.070
Number of temporary layoffs experienced	-1.113 ***	0.265	-2.066 ***	0.217

*** 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 3,441 men born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law) and who are 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 outcome variables cover the period from 1991 to 2010. All models include controls for membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province of birth, and birth cohort. A nearest neighbour matching estimator is used. In all cases, the omitted educational attainment category is high school completion.
Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

Table 6

Estimated relationship between outcome variables and educational attainment for women — Matching estimator results

	College certificate		Bachelor's degree	
	coefficient	standard error	coefficient	standard error
Outcome variable				
Total cumulative earnings (2010 constant dollars)	177,663 ***	15,215	427,560 ***	29,429
Present value of total cumulative earnings (2010 constant dollars)	114,221 ***	9,636	267,257 ***	18,284
Number of years covered by an employer-sponsored pension plan	2.387 ***	0.267	4.249 ***	0.358
Number of years employed	0.748 ***	0.149	1.199 ***	0.190
Number of years in a union	4.143 ***	0.270	5.787 ***	0.366
Number of permanent layoffs experienced	-0.132 ***	0.035	-0.238 ***	0.038
Number of temporary layoffs experienced	-0.557 ***	0.160	-0.832 ***	0.186

*** significantly different from reference category (p<0.001)

Notes: The samples consist of 4,510 women born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law) and who are 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 outcome variables cover the period from 1991 to 2010. All models include controls for membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province of birth, and birth cohort. A nearest neighbour matching estimator is used. In all cases, the omitted educational attainment category is high school completion.

Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

Regression models and matching estimators both provide estimates of the **average** premiums associated with different levels of education, conditional on a set of characteristics. But are the premiums the same for everyone? To answer this question, a series of quantile regressions were estimated at various points of the conditional distribution of earnings.[22] The results are presented in Table 7 (men) and Table 8 (women). For men and women, the results demonstrate that higher premiums are registered at higher points in the earnings distribution for those with a college certificate or a bachelor's degree. At times, the differences are quite large.

For example, men at the 95th percentile of the earnings distribution of bachelor's degree graduates earn about $2.5 million more over the 20-year period than their counterparts at the 95th percentile of the distribution of high school graduates (Table 7). For men at the 5th percentile, a bachelor's degree is associated with additional earnings of only $89,000. The difference is not so pronounced at the college level (ranging from $77,000 at the 5th percentile to $303,000 at the 75th percentile).

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22. 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 educational qualifications 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 education to the same extent as higher-skilled individuals.

Table 7

Estimated relationship between total cumulative earnings and educational attainment for men

	Quantile regression			
	College certificate		Bachelor's degree	
	coefficient	standard error	coefficient	standard error
Total cumulative earnings quantile (2010 constant dollars)				
5th	77,840 **	24,685	89,069 ***	26,611
10th	133,738 ***	32,776	187,380 ***	35,345
25th	232,721 ***	36,622	335,546 ***	39,513
50th	266,132 ***	30,932	503,847 ***	33,434
75th	303,086 ***	33,330	618,892 ***	36,233
90th	231,167 ***	45,423	1,231,135 ***	49,942
95th	275,974 **	102,770	2,452,581 ***	113,153

*** significantly different from reference category (p<0.001)
** significantly different from reference category (p<0.01)

Notes: The samples consist of 3,441 men born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law) and who are 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 analysis covers the period from 1991 to 2010. All models include controls for membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province of birth, and birth cohort. In all cases, the omitted educational attainment category is high school completion.

Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

The variation in premiums is much less pronounced among women (Table 8). For bachelor's degree graduates, premiums range from $34,000 at the 5th percentile to $576,000 at the 95th percentile. The range is smaller among college graduates (from $13,000 at the 5th percentile to $283,000 at the 90th percentile).

Table 8

Estimated relationship between total cumulative earnings and educational attainment for women

	Quantile regression			
	College certificate		Bachelor's degree	
	coefficient	standard error	coefficient	standard error
Total cumulative earnings quantile (2010 constant dollars)				
5th	13,057 *	6,364	34,023 ***	8,175
10th	39,805 **	13,140	104,099 ***	16,770
25th	127,814 ***	16,622	274,611 ***	21,056
50th	212,535 ***	17,405	486,865 ***	22,098
75th	247,076 ***	20,776	545,163 ***	26,424
90th	283,531 ***	28,027	573,111 ***	35,643
95th	238,739 ***	47,844	576,444 ***	60,621

*** 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 sample consists of 4,510 women born in a Canadian province between 1955 and 1957 who hold a high school diploma, a college certificate, or a bachelor's degree (in a field other than law) and who are 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 analysis covers the period from 1991 to 2010. All models include controls for membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province of birth, and birth cohort. In all cases, the omitted educational attainment category is high school completion.
Sources: Statistics Canada, 1991 Census of Population–Longitudinal Worker File and CANSIM table 326-0021.

The gender difference in heterogeneity in the premiums associated with a bachelor's degree warrants further investigation. At the median, men and women benefit more or less equally from a bachelor's degree. The premium is $504,000 for men and $487,000 for women. Where the premiums differ is at the top. At the 95th percentile, a bachelor's degree is associated with $576,000 in additional earnings over the 20-year period for women, which is about the same as at the median. For men, the premium is almost five times larger at the top ($2,453,000). Earlier (in tables 3 and 4), it was reported that a bachelor's degree was associated with several more years of employer-sponsored pension coverage and union membership for women than for men.

Both of these findings—the much larger earnings premium at the top of the distribution for men and the greater number of years of pension coverage and union membership for women—are consistent with female bachelor's degree graduates being more likely than their male counterparts to work in the public sector (including educational services, health care and social assistance, and public administration).[23] While a higher rate of pension coverage and union

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23. According to the 1991 Census–LWF, 64.2% of women whose highest level of educational attainment in 1991 was a bachelor's degree and who were employed in a paid job in 2010 held a public-sector job in that year. In contrast, only 35.3% of their male counterparts held a public-sector job in 2010. The relative gaps were largest in health care and social assistance and in educational services.

membership is observed in the public sector than in the private sector for both men and women, the wage distribution is generally more compressed in the public sector.[24]

To assess these hypotheses, quantile regressions are estimated by main sector (private and public) throughout the 20-year period, with a focus on the bachelor's degree premium (relative to high school graduation). For the purposes of this analysis, private-sector employees are those who worked in the private sector for at least 15 of the 20 years and did not work in the public sector for more than 5 years. Public-sector employees are defined in an analogous manner.

The results are shown in Table 9. In the private sector, there is indeed a large gender difference in the earnings premium at the top of the distribution. A bachelor's degree is associated with $3,635,000 in additional earnings for men at the 95th percentile. For women at the top, a bachelor's degree is associated with a $1,411,000 premium.

In contrast, the earnings premium associated with a bachelor's degree in the public sector is actually higher at the top of the distribution for women than it is for men. For women, the premium is $499,000, while for men it is $307,000.

The implication is that the higher premium associated with a bachelor's degree registered by men at the top is largely the result of two factors: a much larger premium for men in the private sector than in the public sector and the higher likelihood of women working in the public sector than in the private sector.

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24. According to the LWF, 56.8% of public-sector jobs were covered by an employer-sponsored pension plan in 2010, compared to 22.6% of jobs in the private sector. Uppal (2011) reports that three of the top four two-digit industries (based on unionization rates) are the three public sectors (educational services, health care and social assistance, and public administration). Finally, Mueller (1998) found Canadian evidence of wage compression in the public sector compared to the private sector.

Table 9

Estimated relationship between total cumulative earnings and holding a bachelor's degree (relative to a high school diploma)

	Quantile regression							
	Private sector				Public sector			
	Men		Women		Men		Women	
	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error
Quantile[1]								
5th	85,136 *	38,496	-67,558 *	32,111	141,684	182,828	207,558 ***	47,592
10th	127,126 **	48,605	-11,418	31,958	113,434 †	63,843	275,031 ***	35,057
25th	317,208 ***	45,624	105,966 **	38,020	327,497 ***	65,088	346,249 ***	28,779
50th	673,530 ***	47,291	356,729 ***	40,103	301,877 ***	47,340	434,148 ***	29,984
75th	1,131,251 ***	54,936	638,200 ***	51,243	176,453 **	68,181	496,639 ***	25,490
90th	2,163,323 ***	84,433	864,906 ***	90,143	190,132 *	75,042	466,952 ***	49,342
95th	3,635,332 ***	196,917	1,411,014 ***	207,629	306,533	216,112	498,523 ***	70,809

*** 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)

1. Total cumulative earnings quantile (2010 constant dollars).

Notes: The samples consist of 1,708 men and 1,341 women in the private sector and 408 men and 824 women in the public sector born in a Canadian province between 1955 and 1957 who hold either a high school diploma or a bachelor's degree (in a field other than law) and who are present in the Longitudinal Worker File (LWF) at least 18 of the 20 years from 1991 to 2010. Individuals are considered in the private (public) sector if they are employed in the private (public) sector for at least 15 years over the period and then in the public (private) sector for no more than 5 years over the period. Total earnings include wages and salaries, and net self-employment income. The analysis covers the period from 1991 to 2010. All models include controls for membership in a visible-minority group, Aboriginal people, first official language learned and still understood, long-term disability, province of birth, and birth cohort. In all cases, the omitted educational attainment category is high school completion.

Sources: 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 individuals with different levels of schooling may already possess different skills prior to choosing how much education to pursue. Those with more schooling may have the ability to pass exams or have a strong sense of perseverance. Alternatively, those with less schooling may have chosen this path because they have good networking skills, are highly motivated to earn money, or perform well in interviews. While such skills may be reflected in the quantile regression results presented in tables 8 and 9, it is worthwhile to attempt to directly account for skills.

While the Census contains no information on either cognitive or non-cognitive skills, the International Adult Literacy and Skills Survey (IALSS) 2003 contains several measures of cognitive skills, including document and prose literacy, numeracy, and problem-solving. Additionally, the file contains information on the education of respondents' parents—a factor that may also be correlated with labour market outcomes.[25]

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25. 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.

Using the IALSS 2003, the analysis presented above is replicated as closely as possible, with measures of skills and parental education included as well. A few caveats must be noted at the outset. First, the IALSS 2003 analytical sample is somewhat different from the sample used above. It consists of 35- to 54-year-olds who were born in one of the ten Canadian provinces and who had either a high school diploma, a college certificate, or a bachelor's degree at the time of the survey. Also, the wider age range (for a given year) is required given the smaller sample size in the IALSS 2003. Second, men and women are pooled in the analysis, again given low sample sizes. A female dummy variable is included in the models. Third, the IALSS 2003 contains only a measure of annual wages and salaries for 2002 (expressed in 2010 constant dollars here). Fourth, the IALSS contains no measure of disability or visible-minority status, although it does contain all other covariates used in analysis with the 1991 Census–LWF.

Before showing how controlling for parental education and skills measures affects the results, it is worth discussing how different those characteristics are across different levels of education. First, parental education levels are generally higher for those with more schooling. For example, only 6% of high school graduates have at least one parent with a university degree, compared to 26% of bachelor's degree graduates. Second, cognitive skills and schooling are positively correlated, but the relationship is not very strong. For example, bachelor's degree graduates outscore high school graduates by 16% on the numeracy assessment. However, this is the largest gap observed between any two groups on any of the tests. In general, college graduates score somewhat higher than high school graduates, and bachelor's degree graduates score higher still. It is important to note that the IALSS 2003 assessment was geared towards the general adult population and sought to assess how well adults function in society. It was not specifically designed to test knowledge acquired in school. As such, the test scores are not likely endogenous to the level of education. This may also explain why the scores do not vary substantially by level of education.

In Table 10, results from three models are shown. The first includes the base controls, similar to those used with the 1991 Census–LWF. This shows that annual premiums associated with a college certificate and a bachelor's degree are $11,000 and $20,000, respectively. Although a direct comparison is not possible, these results are qualitatively similar to earlier results from the 1991 Census–LWF (see Tables 3 and 4).

Table 10

Estimated relationship between annual wages and salaries (2010 constant dollars) and educational attainment — International Adult Literacy and Skills Survey (2003)

	College certificate		Bachelor's degree	
	coefficient	standard error	coefficient	standard error
Model 1 – Base controls	11,078 *	4,330	20,128 ***	3,268
Model 2 – Model 1 controls plus paternal/maternal education	10,624 *	4,357	19,630 ***	3,426
Model 3 – Model 2 controls plus document/prose literacy, numeracy, and problem-solving	7,620 *	3,769	14,442 ***	4,143

*** significantly different from reference category (p<0.001)
* significantly different from reference category (p<0.05)
Notes: The sample consists of 2,988 individuals betw een the ages of 35 and 54 w ho hold a high school diploma, a college certificate, or a bachelor's degree. Annual w ages and salaries are measured in the reference year 2002. Ordinary least squares models are estimated. All models are pooled across men and w omen. The base controls include variables denoting sex, age, age squared, Aboriginal people, first official language learned and still understood, and province of birth. In all cases, the omitted educational attainment category is high school completion.
Source: Statistics Canada, International Adult Literacy and Skills Survey (2003).

The inclusion of parental education as a control variable has little to no impact on the estimates. However, adding quadratic terms of the four cognitive test scores has a much larger impact. A college certificate is associated with $8,000 in annual earnings, while a bachelor's degree is associated with $14,000 in annual earnings. In both cases, earnings premiums declined by about one-third after accounting for differences in cognitive test scores.

4   Conclusion

This paper examined the long-term labour market premiums associated with completing a college certificate and a bachelor's degree, compared to completing a high school diploma. Several labour market outcomes of individuals are examined from their mid-30s to their mid-50s with longitudinal data.

The findings show that individuals who have a bachelor's degree or a college certificate have more favourable labour market outcomes over their working lives than individuals who have only a high school diploma. More specifically, the earnings premium associated with a bachelor's degree over the 20-year period ranges, on average, from $728,000 for men to $442,000 for women. For a college certificate, the premium is $248,000 for men and $180,000 for women, on average. The earnings premium associated with a bachelor's degree is much larger at the top of the distribution for men than it is for women. This is the result of a much larger premium for men in the private sector than in the public sector and the higher likelihood of women working in the public sector than in the private sector. Within the public sector, the earnings premium associated with a bachelor's degree is larger for women at the top of the distribution than it is for men. The study also finds that, for both men and women, a bachelor's degree and a college certificate are associated with more years of coverage in an employer-sponsored pension plan and fewer layoffs than a high school diploma.

Using an extraneous data set, the International Adult Literacy and Skills Survey (IALSS) 2003, the main results of the study (on earnings) are confirmed in a qualitative sense even when direct skill measures are included in the model along with parental education variables. However, the earnings premiums decline by about one-third.

It is important to note that the results of this study apply to one particular cohort. Long-term outcomes for more recent cohorts are not yet available, and may or may not be similar to those in this study. Furthermore, causal relationships should not be inferred throughout the study.

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