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Wages and Full-time Employment Rates of Young High School Graduates and Bachelor's Degree Holders, 1997 to 2012

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Ottawa, Ontario

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..	not available for a specific reference period
...	not applicable
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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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Abstract

This study examines which factors underlie the narrowing of wage differences observed between young bachelor's degree holders and high school graduates from the 2000-to-2002 period to the 2010-to-2012 period and the widening of differences in full-time paid employment rates between these two groups. The study uncovers three key findings. First, while the oil boom seen during much of the 2000s tended to reduce wage differences across education levels for both young men and young women, the remaining contributing factors differed across gender. Increases in real minimum wages and in the relative supply of bachelor's degree holders tended to narrow wage differences for young women but not for young men. In contrast, movements in unionization rates and in the relative prevalence of temporary jobs reduced the education wage premium for young men but not for young women. The second finding is that increases in real minimum wages appear to have had a dual impact for young women, narrowing wage differences between young female bachelor's degree holders and high school graduates but widening differences in full-time paid employment rates between these two groups. The third finding is that the narrowing of wage differences between young bachelor's degree holders and high school graduates employed in full-time jobs was offset by a widening of differences in full-time paid employment rates between these two education groups. As a result, differences in unconditional average weekly earnings or in average annual wages and salaries between young bachelor's degree holders and high school graduates displayed no trend during the observation period.

Executive summary

From the 2000-to-2002 period to the 2010-to-2012 period, average real weekly wages fell marginally for male bachelor's degree holders who were aged 20 to 34 and employed in full-time jobs and rose about 5% for their female counterparts.

In contrast, average real weekly wages among full-time job holders rose roughly 9% for men and 11% for women aged 20 to 34 who had a high school diploma. Thus, wage differences between young bachelor's degree holders and young high school graduates employed in full-time jobs narrowed in recent years.

Despite this narrowing between these two groups, differences in full-time paid employment rates widened. For example, full-time paid employment rates of young male bachelor's degree holders exceeded those of young male high school graduates by 7.4 percentage points during the 2010-to-2012 period, up from 4.3 percentage points during the 2000-to-2002 period. Among young women, the difference widened from 13.8 percentage points to 18.6 percentage points.

This study examines which factors underlie the narrowing of wage differences seen between young bachelor's degree holders and high school graduates from the 2000-to-2002 period to the 2010-to-2012 period and the widening of differences in full-time paid employment rates between these two groups.

Four types of factors are considered: those associated with changes in labour supply, labour demand, institutions and employer–employee contracts, and general economic conditions.

Changes in the population of bachelor's degree holders relative to the population of high school graduates are used to capture changes in relative labour supply.

Variables to measure the oil boom, the construction boom, the employment bust in computer and telecommunications (CT) industries and changes in the value of the Canadian dollar on foreign exchange markets are used to capture shifts in labour demand that may affect the education wage premium, i.e., wage differences between bachelor's degree holders and young high school graduates.

Changes in real minimum wages, youth unionization rates and the relative incidence of temporary work between the two groups are used to capture institutional changes.

Movements in the unemployment rate of men aged 35 to 54 are used to control for changes in labour market conditions.

The study correlates cross-regional movements in youth outcomes with cross-regional changes in key explanatory variables. To do so, it takes advantage of the fact that wage differences between young bachelor's degree holders and high school graduates as well as many of the aforementioned explanatory variables evolved differently across regions. For instance, between 2000–2002 and 2010–2012, experience-adjusted differences in log weekly wages between young male bachelor's degree holders and high school graduates employed full-time fell by at least 15 log points (roughly 15 percentage points) in Alberta and Saskatchewan but by only about 3 log points in Ontario. Likewise, real minimum wages grew by 25 log points or more in Manitoba, Newfoundland and Labrador as well as the other Atlantic provinces (considered collectively) but fell by about 2 log points in British Columbia.

The study uncovers three main findings. The first is that while the oil boom seen during much of the 2000s tended to reduce wage differences across education levels for both young men and young women, the remaining contributing factors differed across gender. Rising real minimum wages and rising relative supply of bachelor's degree holders tended to reduce the education wage premium for young women but not for young men. Movements in unionization rates and in

the relative importance of temporary jobs reduced the education wage premium for young men but not for young women.

The second finding is that increases in real minimum wages appear to have had a dual impact for young women: they were associated with a narrowing in wage differences between young female bachelor's degree holders and high school graduates but with a widening of differences in rates of full-time paid employment between these two groups.

The third finding is that the narrowing of wage differences between young bachelor's degree holders and high school graduates employed in full-time jobs was offset by a widening of differences in full-time paid employment rates between these two education groups. As a result, differences in unconditional average weekly earnings or in average annual wages and salaries between young bachelor's degree holders and high school graduates displayed no trend during the observation period. This finding is important since it informs discussions on earnings inequality between these two education groups. It shows that while between-group inequality in annual wages and salaries displayed no trend during the 2000s, between-group inequality in hourly wages (or weekly wages) fell as a result of several factors including movements in oil prices, increases in real minimum wages and relative labour supply effects. In sum, after rising from 1980 to 2000, cross-educational differences in the price of labour actually fell for young workers during the 2000s.

1 Introduction

The level of schooling one chooses to complete is perhaps one of the most important investment decisions people make over their lifetime. The numerous studies reviewed by Card (2001) place the rate of return to a year of schooling at roughly 10% in terms of annual wages. Consequently, education decisions may have implications for one's future ability to establish a family, purchase a home, pay for their own children's education, save for retirement, etc. More widely, the rate of return to schooling may have implications for income inequality and intergenerational income mobility.

Despite the well-established estimates of the returns to schooling in the literature, the broader population is generally not well informed about the benefits of higher education (Frenette and Robson 2011). Parents and their high-school-aged children generally undervalue the returns to postsecondary education, including university.

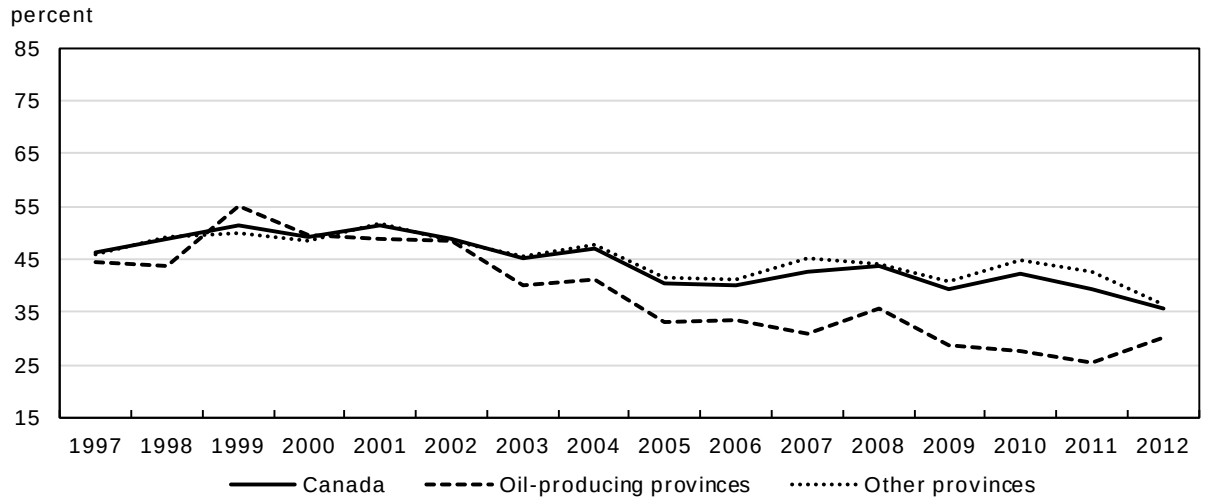
Further complicating matters is the fact that wage differences across education levels are not constant over time. For example, Boudarbat et al. (2010) show that pay differences across education levels increased in the 1980s and 1990s, especially among men, but Morissette et al. (2013) note that this trend was reversed in the 2000s, especially among workers under 35. Beginning in the 2000s, wages of young bachelor's degree holders employed in full-time jobs either declined or grew moderately while those of young high school graduates grew faster (Table 1). As a result, wage differences between these two groups narrowed during the 2000s, especially in the oil-producing provinces of Alberta, Saskatchewan and Newfoundland and Labrador (Chart 1 and Chart 2).

Table 1
Average real wages of full-time employees aged 20 to 34, 2000 to 2002 and 2010 to 2012

	Men		Women	
	High school diploma	Bachelor's degree	High school diploma	Bachelor's degree
	2002 dollars			
Panel 1 – Average real weekly wages				
2000 to 2002	616	874	468	730
2010 to 2012	668	861	519	761
	percentage points			
Percentage change	8.5	-1.5	11.0	4.3
	2002 dollars			
Panel 2 – Average real hourly wages				
2000 to 2002	14.92	21.88	12.21	19.09
2010 to 2012	16.26	21.82	13.57	20.07
	percentage points			
Percentage change	9.0	-0.3	11.1	5.1

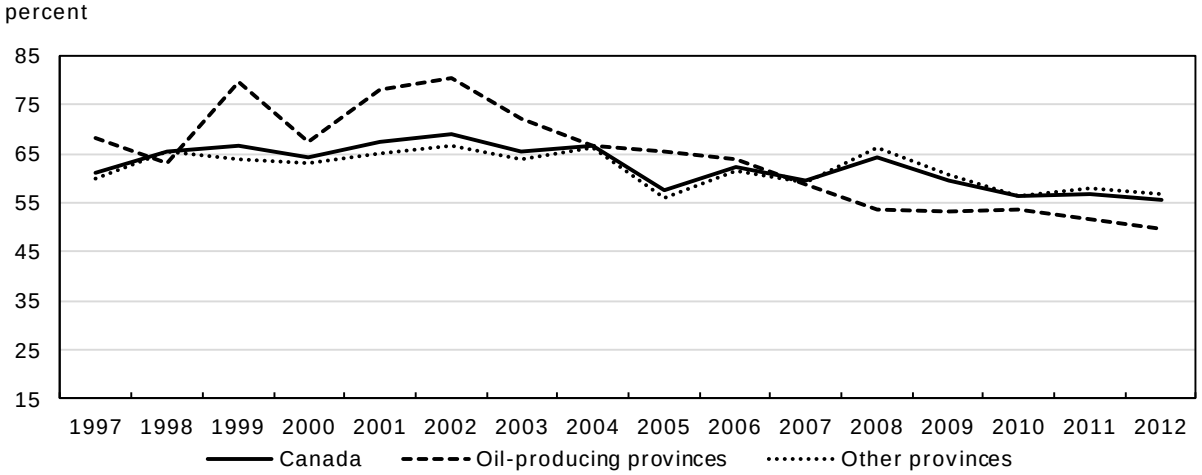
Source: Statistics Canada, Labour Force Survey.

Chart 1
Differences in average weekly wages between male bachelor's degree holders and high school graduates aged 20 to 34 and employed in full-time jobs, by region, 1997 to 2012



Note: Oil-producing provinces include Alberta, Saskatchewan, and Newfoundland and Labrador. Percentage differences are computed from region- and year-specific log weekly wage models that control for a quadratic term in potential labour market experience as well as workers' education levels. Estimates of log wage differences are aggregated across regions in a given year using region- and year-specific employment estimates as weights. The resulting statistics are converted into percentage differences by using their antilog minus one.
Source: Statistics Canada, Labour Force Survey.

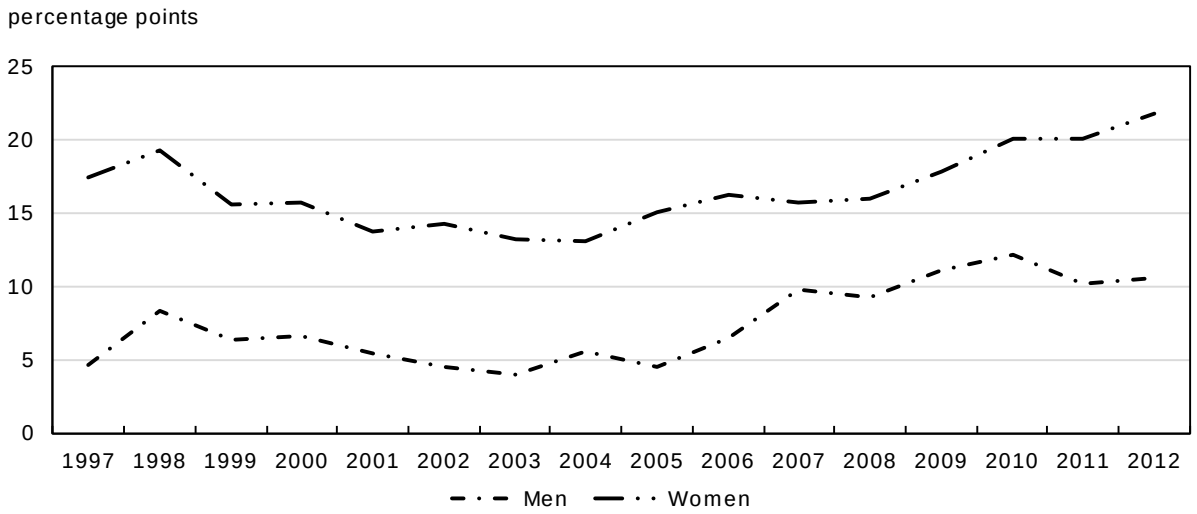
Chart 2
Differences in average weekly wages between female bachelor's degree holders and high school graduates aged 20 to 34 and employed in full-time jobs, by region, 1997 to 2012



Note: Oil-producing provinces include Alberta, Saskatchewan, and Newfoundland and Labrador. Percentage differences are computed from region- and year-specific log weekly wage models that control for a quadratic term in potential labour market experience as well as workers' education levels. Estimates of log wage differences are aggregated across regions in a given year using region- and year-specific employment estimates as weights. The resulting statistics are converted into percentage differences by using their antilog minus one.
Source: Statistics Canada, Labour Force Survey.

Another source of complexity is that wage differences across education levels are only one dimension that may affect schooling decisions. The extent to which additional schooling increases individuals' chances of getting a full-time job is also an important dimension. Yet both dimensions evolved differently in recent years. While wage differences between young bachelor's degree holders and high school graduates holding full-time jobs narrowed in recent years, differences in full-time paid employment rates between the two groups widened (Chart 3 and Chart 4), especially in non-oil-producing provinces (Chart 5, Chart 6, Chart 7, and Chart 8).[1] Hence, whether high school graduates gained ground, in recent years, relative to their counterparts with a bachelor's degree depends crucially on which labour market outcome and region is considered.

Chart 3
Differences in full-time paid employment rates between bachelor's degree holders and high school graduates aged 20 to 34, by sex, 1997 to 2012

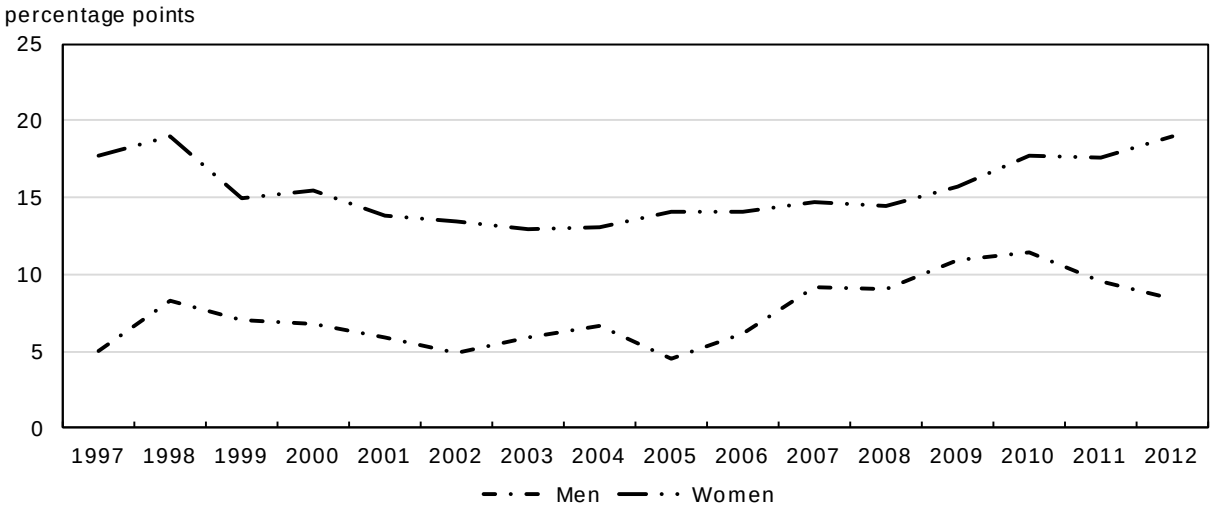


Note: Percentage-point differences are computed from region- and year-specific models of full-time paid employment that control for a quadratic term in potential labour market experience as well as workers' education levels. Differences are aggregated across regions in a given year using region- and year-specific employment estimates as weights.

Source: Statistics Canada, Labour Force Survey.

1. During the 2000-to-2002 period, the full-time paid employment rate of young male high school graduates was 68.0% and that of young male bachelor's degree holders, 72.3%. The corresponding percentages for the 2010-to-2012 period were 60.8% and 68.2%, respectively. The full-time paid employment rate of young female high school graduates was 49.1% and that of bachelor's degree holders, 62.9% during the former period, compared with 44.2% and 62.8%, respectively, during the latter.

Chart 4
Differences in full-time paid employment rates between bachelor's degree holders and high school graduates aged 20 to 34, by sex, 1997 to 2012 (full-time students excluded)



Note: Percentage-point differences are computed from region- and year-specific models of full-time paid employment that control for a quadratic term in potential labour market experience as well as workers' education levels. Differences are aggregated across regions in a given year using region- and year-specific employment estimates as weights.

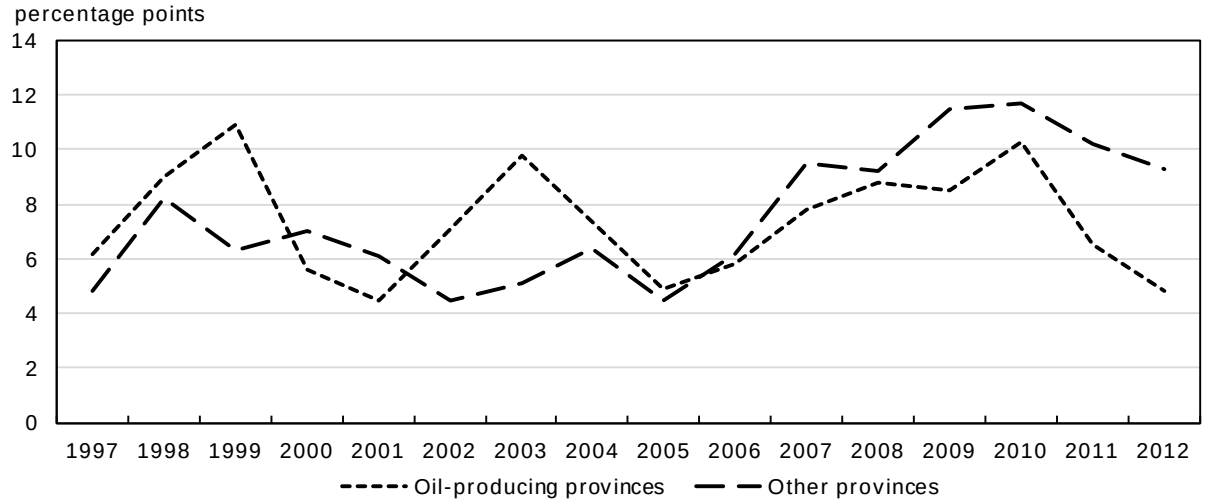
Source: Statistics Canada, Labour Force Survey.

Chart 5
Differences in full-time paid employment rates between male bachelor's degree holders and high school graduates aged 20 to 34, by region, 1997 to 2012

Note: Oil-producing provinces include Alberta, Saskatchewan, and Newfoundland and Labrador. Percentage-point differences are computed from region- and year-specific models of full-time paid employment that control for a quadratic term in potential labour market experience as well as workers' education levels. Differences are aggregated across regions in a given year using region- and year-specific employment estimates as weights.

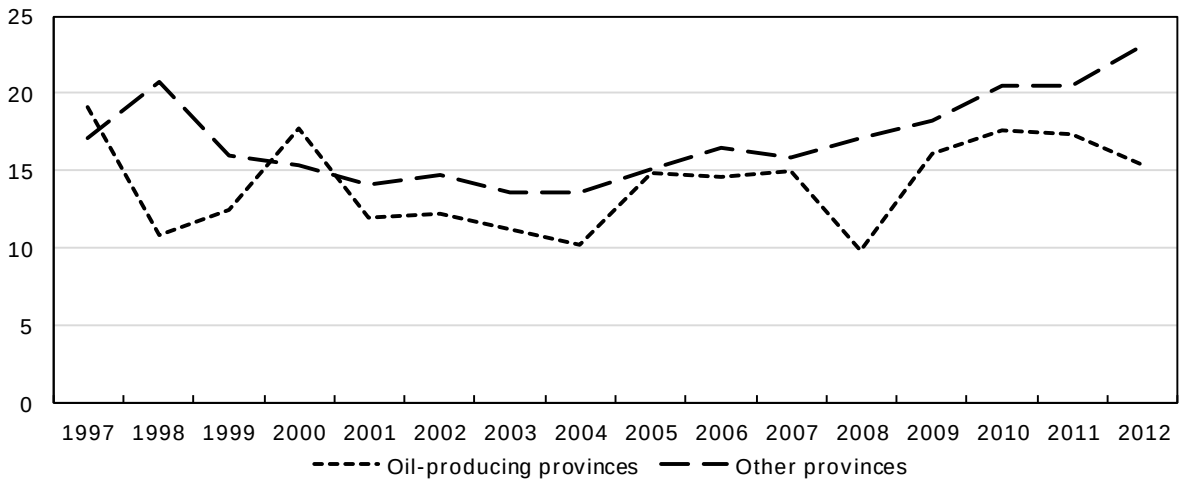
Source: Statistics Canada, Labour Force Survey.

Chart 6
Differences in full-time paid employment rates between male bachelor's degree holders and high school graduates aged 20 to 34, by region, 1997 to 2012 (full-time students excluded)



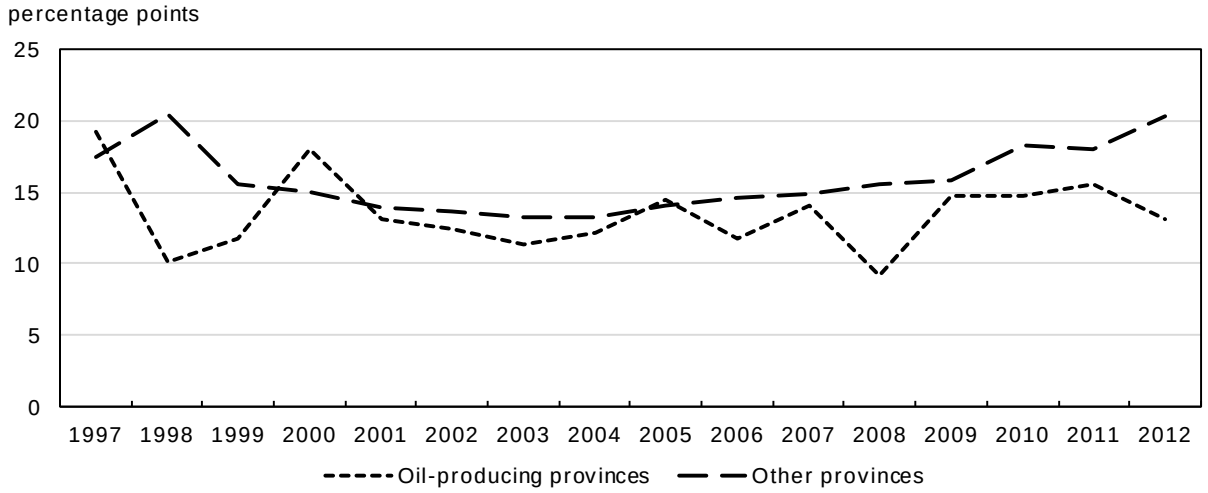
Note: Oil-producing provinces include Alberta, Saskatchewan, and Newfoundland and Labrador. Percentage-point differences are computed from region- and year-specific models of full-time paid employment that control for a quadratic term in potential labour market experience as well as workers' education levels. Differences are aggregated across regions in a given year using region- and year-specific employment estimates as weights.
Source: Statistics Canada, Labour Force Survey.

Chart 7
Differences in full-time paid employment rates between female bachelor's degree holders and high school graduates aged 20 to 34, by region, 1997 to 2012



Note: Oil-producing provinces include Alberta, Saskatchewan, and Newfoundland and Labrador. Percentage-point differences are computed from region- and year-specific models of full-time paid employment that control for a quadratic term in potential labour market experience as well as workers' education levels. Differences are aggregated across regions in a given year using region- and year-specific employment estimates as weights.
Source: Statistics Canada, Labour Force Survey.

Chart 8
Differences in full-time paid employment rates between female bachelor's degree holders and high school graduates aged 20 to 34, by region, 1997 to 2012 (full-time students excluded)



Note: Oil-producing provinces include Alberta, Saskatchewan, and Newfoundland and Labrador. Percentage-point differences are computed from region- and year-specific models of full-time paid employment that control for a quadratic term in potential labour market experience as well as workers' education levels. Differences are aggregated across regions in a given year using region- and year-specific employment estimates as weights.

Source: Statistics Canada, Labour Force Survey.

This paper has two objectives. The first is to explain the narrowing of the education wage premium—as measured by differences in log weekly (hourly) wages between bachelor's degree holders and high school graduates—which has been observed in recent years for workers aged 20 to 34. To do so, the study assesses the role played by movements in the relative labour supply of graduates, labour demand conditions (specifically in the oil, construction, manufacturing and high-tech sectors), institutional factors (minimum wages, unionization and temporary work) and changes in aggregate labour market conditions.

The second goal of the study is to explain the widening of differences in full-time paid employment rates between the two groups of young workers in recent years. Several of the factors mentioned above are considered while attempting to do so.

The study uncovers three key findings. First, while the oil boom seen during much of the 2000s tended to reduce wage differences across education levels for both young men and young women, the remaining contributing factors differed across gender. Increases in real minimum wages and in the relative supply of bachelor's degree holders reduced cross-educational wage differences for young women but not for young men. Movements in unionization rates and in the relative importance of temporary jobs reduced the education wage premium for young men but not for young women.

The second finding is that increases in real minimum wages appear to have had a dual impact for young women: they were associated with a narrowing of wage differences between young female bachelor's degree holders and young female high school graduates but with a widening of differences in full-time paid employment rates between these two groups.

The third finding is that the narrowing of wage differences between young bachelor's degree holders and high school graduates employed in full-time jobs was offset by a widening of differences in full-time paid employment rates between these two education groups. As a result, differences in unconditional average weekly earnings or in average annual wages and salaries

between young bachelor's degree holders and high school graduates displayed no trend during the observation period. Thus, analyses based solely on differences in annual wages and salaries between the two groups would fail to identify the two offsetting changes that took place from the early 2000s to the early 2010s: a narrowing of cross-educational wage differences taking place in conjunction with a widening of differences in full-time paid employment rates.

The paper proceeds as follows. The data and methods used in this study are described in Section 2. The results appear in Section 3. The study concludes by discussing the findings.

2 Data and methods

The data are drawn from the Labour Force Survey (LFS), which provides the most current wage data and has collected monthly wage and education information in a consistent manner since 1997. The LFS files used in this study cover the 1997-to-2012 period, with a focus on the post-2000 trends in wages and full-time employment rates.[2]

2.1 Wage differences across education levels

When the evolution of wage differences across education levels is investigated, the sample consists of full-time paid workers between the ages of 20 and 34, earning at least $75 per week in 2000 constant dollars in their main job, and living in one of the ten provinces.[3]

The analytical approach consists of two steps. First, gender-, region- and year-specific regressions of log weekly earnings and log hourly wages are run, using the following specification:

$$\ln W_{irt} = B_0 + B_1 EXP_{irt} + B_2 EXP_{irt}^2 + \alpha_1 LTHS_{irt} + \alpha_2 TRADES_{irt} + \alpha_3 PSE_{irt} + \alpha_4 BA_{irt} + \alpha_5 POST_{irt} + u_{irt} \quad (1)$$

where $\ln W_{irt}$ denotes the log weekly (hourly) wages of worker i living in region r in year t. The terms EXP_{irt} and EXP^2_{irt} measure potential labour market experience and its squared value, respectively. The remainder of equation (1) includes binary indicators for various levels of education (less than high school—$LTHS_{irt}$, trades certificate or diploma—$TRADES_{irt}$, postsecondary education below bachelor's degree—PSE_{irt}, bachelor's degree—BA_{irt}, master's degree or higher levels of education—$POST_{irt}$): high school graduates are the reference (omitted) group. The parameter α_4 measures experience-adjusted differences in log weekly (hourly) wages between young bachelor's degree holders (BA_{irt}) and high school graduates. For both men and women, equation (1) is estimated 128 times, i.e., separately for each of the 8 regions considered and the 16 years of the 1997-to-2012 period.[4] This yields, among other parameters, 128 estimated values of α_4.

2. Annual data are created by selecting individuals in all months for each year. Although individuals appear more than once, this does not pose a clustering issue when calculating standard errors since our outcome variables are defined at the regional–year level.
3. The $75 cutoff is used to make the sample selection comparable to that used in Boudarbat et al. (2010).
4. From 2000 to 2008, Prince Edward Island, Nova Scotia and New Brunswick saw their real gross domestic product (GDP) increase at very similar rates: 17.8%, 18.1% and 18.7%, respectively (CANSIM table 379-0025). By contrast, Newfoundland and Labrador experienced a 40.4% increase in GDP over this period. For this reason, Prince Edward Island, Nova Scotia, and New Brunswick are grouped together in the analysis. This yields eight regions tracked over 16 years for a total of 128 cells.

In a second step, the 128 estimated values of α_4 are regressed on region indicators (θ_r), year effects (δ_t) and a vector Z_{rt} of explanatory variables defined at the gender–region–year level.[5]

$$\alpha_{4rt} = \theta_r + \delta_t + \beta Z_{rt} + e_{rt} \quad (2)$$

Region indicators allow wage differences between young bachelor's degree holders and high school graduates to vary across regions due to regional differences in industrial structure, occupational structure or firm size. Year effects allow wage differences at the national level to vary over time because of unmeasured factors such as changes in technology and in competition intensity, both within industries and from abroad. The vector Z_{rt} captures institutional changes as well as movements in labour supply, labour demand and aggregate labour market conditions. It consists of 10 explanatory variables defined below. Movements in labour supply are captured by changes in the (logarithm of the) ratio of the number of young bachelor's degree holders to the number of high school graduates. Movements in labour demand are captured by variables related to four events: the oil boom of the 2000s, the construction boom of the 2000s, the high-tech bust of the early 2000s and the appreciation of the Canadian dollar on foreign exchange markets after 2002. Institutional changes are measured using movements in real minimum wages, region-level youth unionization rates, differences in unionization between young bachelor's degree holders and high school graduates as well as the relative incidence of temporary work between the two groups. Finally, movements in aggregate labour market conditions are captured by the unemployment rate of men aged 35 to 54.

Using the estimated values of β, equation (2) enables an assessment of the degree to which movements in Z_{rt} account for the narrowing of the education wage premium. Specifically, the proportion of the change in the education wage premium that can be explained by a given explanatory variable (for example, changes in minimum wages) is estimated by multiplying the relevant coefficient in β by the observed change in this variable. The focus is on changes in the education wage premium observed during the periods 2000 to 2002 and 2010 to 2012.[6]

The methodological approach used in this study relies on cross-regional variation in movements in key explanatory variables. For instance, to identify the impact of minimum wages on the education wage premium, minimum wages must have increased more in some regions than in others during the observation period. If such cross-regional variation is absent, the impact of a given component of Z_{rt} on the education wage premium will be indistinguishable from year effects (δ_t). Readers should also keep in mind that this approach captures both the direct and indirect effects of changes in a given explanatory variable on the education wage premium. For example, an oil boom may not only raise wages for workers in the oil sector; it may raise demand for intermediate inputs used by the oil industry. If workers employed in sectors that produce these intermediate inputs are predominantly high school graduates, the ensuing reduction in the bachelor's degree–high school wage ratio will reflect both sets of influences.[7]

5. Following Solon et al. (2013), equation (2) is estimated using ordinary (unweighted) least squares as well as weighted least squares, where (gender-specific) estimates of the population of full-time paid workers aged 20 to 34 in region r in year t are used as weights. LFS sampling weights are used for estimating equation (1).
6. This approach is similar to a standard Oaxaca decomposition (Oaxaca 1973), except that the coefficients used are derived from a pooled model (Oaxaca and Ransom 1994).
7. A positive economic shock may also raise the bargaining power of workers in specific local labour markets, thereby potentially altering the education wage premium through spillover effects. For this reason, an oil boom may also alter the education wage premium among groups of workers—such as young women—who have little involvement in the oil industry.

Labour supply movements

In a simple supply–demand framework, an increase in the supply of bachelor's degree holders relative to that of high school graduates should reduce the education wage premium, i.e., the wage differences between the two groups. The reason is simple: faster growth in the population of bachelor's degree holders than in the population of high school graduates will decrease the relative scarcity of the former group. To capture changes in relative labour supply, the logarithm of the ratio of the number of bachelor's degree holders aged 20 to 34 to the number of high school graduates aged 20 to 34 is computed. Two versions of this variable are used, one that is gender-specific and a second one that is not.

Labour demand movements

Several factors may have changed the demand for high school graduates and bachelor's degree holders in recent years: sharp increases in world oil prices, the housing boom during the 2000s, the appreciation of the Canadian dollar on foreign exchange markets after 2002 and the bust observed in the computer and telecommunications (CT) sector at the beginning of the 2000s.

From 2000 to 2008, prices received by Canadian oil producers doubled (Table 2). In addition, the number of housing starts rose substantially. Since male high school graduates are more often employed in the oil and construction industries than male bachelor's degree holders (Table 3), rising world oil prices and the sharp growth in housing demand may have pushed up wages among the former group to a greater extent than among the latter. The decline in employment in the CT sector after 2001 (Bowlby and Langlois 2002; Frenette 2007) may also have contributed to reducing the education wage premium by reducing the relative demand for bachelor's degree holders, who are employed in CT to a much greater extent than their counterparts with a high school diploma (Table 3). Conversely, the substantial appreciation of the Canadian dollar after 2002 (Table 2) may have reduced labour demand for high school graduates to a greater extent than for bachelor's degree holders, given that high school graduates were employed in manufacturing—a sector exposed to exchange rate fluctuations—more often than individuals with a bachelor's degree during the late 1990s (Table 3).[8]

8. As Appendix 1 shows, the impact of exchange rate appreciation is captured by a variable that equals the value of the Canadian dollar in year $t-1$ times the percentage of young male (female) workers employed in manufacturing in a given region during the 1997-to-1999 period. The impact of the oil shock is captured by a variable that equals oil prices in year $t-1$ times the percentage of young male (female) workers employed in the oil industry in a given region during the 1997-to-1999 period. Thus, cross-regional differences in the relative importance of manufacturing and oil during the late 1990s (e.g. with Quebec and Ontario having relatively high employment shares in manufacturing and Alberta, Saskatchewan, and Newfoundland and Labrador having relatively high employment shares in the oil industry: see Table 4) help disentangle the impact of exchange rate appreciation from the impact of rising oil prices. A comparison of Table 4 and Table 12 (shown in the Appendix) indicates, as expected, that the percentage of young men employed in construction and in the oil industry increased from 1997–1999 to 2010–2012. Conversely, the percentage of young men and women employed in manufacturing and the percentage of young women employed in the computer and telecommunications industry fell.

Table 2
Aggregate statistics, 1996 to 2012

Year	Column 1 Industrial product price index — Petroleum and coal products	Column 2 Housing starts (all units)	Column 3 Employment in computer and telecommunications industries (paid workers aged 20 to 34)	Column 4 Exchange rate (U.S. dollars per Canadian dollar)
	index	dollars	number	rate
1996	80.1	124,713	169,571	0.733
1997	79.6	147,040	192,124	0.722
1998	65.5	137,439	216,631	0.674
1999	76.6	149,968	219,328	0.673
2000	111.7	151,653	260,380	0.673
2001	106.5	162,733	267,164	0.646
2002	100.0	205,034	227,615	0.637
2003	110.0	218,426	215,909	0.714
2004	129.4	233,431	204,660	0.768
2005	159.9	225,481	199,315	0.825
2006	174.2	227,395	204,422	0.882
2007	183.5	228,343	211,499	0.931
2008	230.2	211,056	213,187	0.937
2009	165.6	149,081	195,013	0.876
2010	186.8	189,930	186,007	0.971
2011	232.3	193,950	192,868	1.011
2012	237.3	214,827	199,375	1.001

Note: For 2012, the price index for petroleum and coal products is an average across the first 10 months of that year.

Sources: Statistics Canada, CANSIM table 329-0065 (Column 1), CANSIM table 027-0009 (Column 2), Labour Force Survey (Column 3), and CANSIM table 176-0064 (noon spot exchange rate) (Column 4).

Table 3
Descriptive statistics, full-time paid workers aged 20 to 34

	Men		Women	
	High school diploma	Bachelor's degree	High school diploma	Bachelor's degree
	percent			
Percentage employed in 1997 to 1999 in				
Computer and telecommunications	2.5	13.3	3.8	6.3
Construction	8.9	1.9	1.3	0.7
Manufacturing	28.5	16.7	16.9	8.8
Oil industry	2.3	1.2	0.4	0.5
	2002 dollars			
Real hourly wages in 1997 to 1999				
Average real hourly wages	14.68	20.73	12.34	18.42
Median real hourly wages	13.49	19.71	11.09	17.84
Real hourly wages at the 25th percentile	10.26	14.61	8.61	13.28
Real hourly wages at the 10th percentile	8.17	10.72	7.49	9.63
Average real minimum wages, 1997 to 1999 (Employment-weighted)	7.11	7.11	7.11	7.11

Note: Percentiles are gender- and education-specific.

Source: Statistics Canada, Labour Force Survey.

These factors are captured by the four following variables, whose construction is detailed in Appendix 1: the oil price variable, housing starts variable, exchange rate variable and youth share of employment in CT. Since movements in labour demand and labour supply may affect wages with a lag, the one-year lagged value of these four variables and of the aforementioned labour supply variables are used in Z_{rt} in all regression analyses.

Institutional changes

During the 2000s, real minimum wages increased in most provinces (Table 5). Since high school graduates earn lower wages (and are more likely to be employed in minimum-wage jobs) than bachelor's degree holders, these minimum wage increases may have reduced the education wage premium. The impact of increased minimum wages on the education wage premium is expected to be more important for women since female high school graduates earn lower wages than their male counterparts (Table 3). The contemporaneous value (i.e., the value in year t when year t is considered) of the logarithm of real minimum wages is used in Z_{rt}.[9]

Since unions tend to raise wages more among low-skilled workers than among their high-skilled counterparts (Lemieux 1998), a rise in unionization rates may reduce the bachelor's degree–high school wage ratio. Conversely, differences in unionization rates between young bachelor's degree holders and high school graduates may be positively correlated with the bachelor's degree–high school wage ratio if group-specific wages are pulled up to a greater extent in groups of workers where unionization rates are higher. Movements in unionization are measured by the contemporaneous value of the percentage of workers who are union members in a given region in a given year. Differences in unionization rates between young bachelor's degree holders and high school graduates are captured by using the contemporaneous value of these differences.

9. For the region that includes Prince Edward Island, Nova Scotia and New Brunswick, minimum wages are an employment-weighted average of province-specific minimum wages. Province-specific values of the Consumer Price Index (All Items) are used as a deflator.

Table 4
Percentage of high school graduates and bachelor's degree holders employed in specific industries, by province, 1997-to-1999 average

	Computer and telecommunications	Construction	Manufacturing	Oil
		percent		
Panel 1 – Men aged 20 to 34				
Newfoundland and Labrador	3.4	4.1	12.9	2.6
Other Atlantic provinces	4.5	6.2	18.2	0.7
Quebec	8.0	4.0	29.3	0.3
Ontario	7.7	5.8	28.0	0.4
Manitoba	3.5	7.0	22.3	0.9
Saskatchewan	2.9	5.5	17.0	7.0
Alberta	5.7	8.5	14.5	9.7
British Columbia	5.2	8.6	18.8	1.2
All provinces	6.6	6.2	24.0	1.9
Panel 2 – Women aged 20 to 34				
Newfoundland and Labrador	3.0	0.2	4.7	0.5
Other Atlantic provinces	2.8	1.0	8.1	0.1
Quebec	5.6	0.7	16.8	0.1
Ontario	5.8	1.0	16.0	0.1
Manitoba	2.5	0.9	10.9	0.0
Saskatchewan	2.5	0.6	4.7	0.5
Alberta	4.9	1.7	5.7	3.4
British Columbia	5.0	0.9	7.5	0.3
All provinces	5.1	1.0	12.7	0.5

Note: Full-time paid workers aged 20 to 34.

Source: Statistics Canada, Labour Force Survey.

Along with movements in minimum wages and unionization rates, changes in the type of contracts established between employers and employees may affect the education wage premium. Since temporary jobs generally pay less than permanent jobs (Galarneau 2005), faster growth in temporary employment among bachelor's degree holders should tend to reduce the education wage premium. This notion is captured by computing the contemporaneous value of the difference in the percentage of bachelor's degree holders and high school graduates with temporary jobs.

Aggregate labour market conditions

There is evidence that wages of low-skilled workers tend to increase when the unemployment rate reaches historically low levels (Mishel et al. 2012). Since labour market conditions improved from the early 2000s until 2008, part of the reduction in the education wage premium seen in Chart 1 and Chart 2 could be related to a tightening of the labour market. The contemporaneous value of the unemployment rate of men aged 35 to 54 is used to take account of the influence of aggregate labour market conditions on the education wage premium.

2.2 Differences in full-time paid employment rates

When investigating the evolution of differences in full-time paid employment rates between high school graduates and bachelor's degree holders, the sample consists of individuals aged 20 to 34 living in one of the 10 provinces.

The methodology used is identical to that outlined in Subsection 2.1, with two exceptions. First, the dependent variable in equation (1) now equals 1 if a person is employed full-time in a paid job, and 0 otherwise. As a result, the dependent variable used in equation (2) now measures experience-adjusted differences in full-time paid employment rates (rather than in log wages) between young bachelor's degree holders and high school graduates. Second, since by definition full-time employment rates measure the portion of 'labour suppliers' holding full-time jobs, the vector Z_{rt} is redefined to account for the fact that movements in full-time paid employment rates are plausibly driven by changes in labour demand, in aggregate labour market conditions and in institutions, rather than by changes in labour supply.

3 Results

3.1 Wage differences across education levels

Table 5 and Table 6 show, for young men and for young women, respectively, how the education wage premium and most of the explanatory variables defined above changed from the early 2000s to the late 2000s.[10] Between 2000–2002 and 2010–2012, the education wage premium narrowed to different extents across regions. Among young men, experience-adjusted differences in log weekly wages between bachelor's degree holders and high school graduates fell by at least 15 log points (roughly 15 percentage points) in Alberta and Saskatchewan but by only about 3 log points in Ontario (Table 5). Among young women, such differences narrowed more sharply in Newfoundland and Labrador and Alberta than they did in other provinces (Table 6).

Likewise, several of the key explanatory variables used in Z_{rt} displayed differential movements across regions. Among young men, the oil price variable increased more in the three main oil-producing provinces (Alberta, Saskatchewan and Newfoundland and Labrador) than it did in other provinces.[11] Relative labour supply showed little change in Saskatchewan but strong increases in British Columbia and Newfoundland and Labrador. The unionization rate rose about 4 percentage points in Quebec and Newfoundland and Labrador, but fell by about the same amount in British Columbia. As expected, the CT variable fell more in Quebec and Ontario than it did elsewhere. Real minimum wages grew by 25 log points or more in Manitoba, Newfoundland and Labrador as well as the other Atlantic provinces (considered collectively) but fell by about 2 log points in British Columbia. Among young women, differential movements in key explanatory variables are also observed across regions.

Regression results from equation (2) are presented for young men in Table 7 and for young women in Table 8. The upper panel of each table shows numbers based on log weekly wages; the lower panel shows results based on log hourly wages. The first two columns report parameter estimates from weighted least squares regressions, in which the estimated numbers of full-time male (female) paid workers aged 20 to 34 in region r in year t are used as weights. The next two columns are based on unweighted regressions, which give an equal weight to each of the eight regions considered in this paper. In all cases, regression models allow for the presence of first-order serial correlation in the error term of equation (2).

10. Changes in the education wage premium are obtained from equation (1) by averaging the estimated values of α_4 across years of a given period (2000–2002 or 2010–2012).

11. Given that the oil price variable equals the product of oil prices and youth employment share in the oil industry in 1997–1999 (Appendix 1), this pattern is expected: young men in these three provinces were, during the late 1990s, employed in the oil industry more often than their counterparts in other provinces (Table 4).

Table 5
Changes in the education wage premium and key explanatory variables, by province — Men aged 20 to 34

Provinces	Change from 2000–2002 to 2010–2012									
	Education wage premium	Relative labour supply	Oil price	Housing starts	Computer and telecommuni-cations	Exchange rate	Log minimum wages	Rate of unionization	Difference in the incidence of temporary jobs	Unemployment rate of men aged 35 to 54
	number									
Newfoundland and Labrador	-0.047	0.250	0.027	0.062	-0.192	0.036	0.368	0.039	0.051	-0.024
Other Atlantic provinces	-0.050	0.100	0.007	0.006	-0.230	0.053	0.270	0.023	0.023	-0.008
Quebec	-0.085	0.195	0.003	0.026	-0.416	0.088	0.125	0.040	-0.029	-0.007
Ontario	-0.034	0.169	0.004	-0.010	-0.433	0.081	0.196	0.003	0.001	0.016
Manitoba	-0.090	0.080	0.008	0.062	-0.173	0.062	0.253	0.026	-0.007	0.000
Saskatchewan	-0.196	0.014	0.063	0.094	-0.153	0.044	0.205	0.007	-0.005	-0.007
Alberta	-0.150	0.080	0.102	-0.007	-0.310	0.045	0.180	0.010	0.022	0.007
British Columbia	-0.060	0.247	0.012	0.033	-0.297	0.053	-0.020	-0.038	0.017	-0.005
All provinces	-0.077	0.150	0.026	0.012	-0.381	0.067	0.155	0.008	0.001	0.003

Note: The education wage premium shown in this table is based on log weekly wages. The numbers shown for relative labour supply are gender-specific.

Source: Statistics Canada, Labour Force Survey.

Table 6
Changes in the education wage premium and key explanatory variables, by province — Women aged 20 to 34

Provinces	Change from 2000–2002 to 2010–2012									
	Education wage premium	Relative labour supply	Oil price	Housing starts	Computer and telecommuni-cations	Exchange rate	Log minimum wages	Rate of unionization	Difference in the incidence of temporary jobs	Unemployment rate of men aged 35 to 54
	number									
Newfoundland and Labrador	-0.172	0.434	0.004	0.005	-0.114	0.013	0.368	0.041	0.020	-0.024
Other Atlantic provinces	-0.095	0.347	0.001	0.001	-0.139	0.022	0.269	0.058	-0.003	-0.008
Quebec	-0.099	0.417	0.000	0.003	-0.300	0.051	0.125	0.075	0.028	-0.007
Ontario	-0.022	0.359	0.001	-0.001	-0.319	0.044	0.196	0.039	-0.026	0.016
Manitoba	-0.046	0.315	0.001	0.006	-0.136	0.030	0.252	0.047	0.006	0.000
Saskatchewan	-0.106	0.368	0.008	0.008	-0.170	0.013	0.205	0.036	-0.005	-0.007
Alberta	-0.144	0.233	0.035	-0.001	-0.240	0.019	0.180	0.014	-0.049	0.007
British Columbia	-0.031	0.420	0.003	0.004	-0.225	0.019	-0.020	0.005	0.025	-0.005
All provinces	-0.066	0.359	0.006	0.001	-0.274	0.035	0.159	0.042	-0.005	0.003

Note: The education wage premium shown in this table is based on log weekly wages. The numbers shown for relative labour supply are gender-specific.

Source: Statistics Canada, Labour Force Survey.

Table 7
Wage differences — Regression results for men aged 20 to 34

	Weighted data and gender-specific labour supply	Weighted data and non-gender-specific labour supply	Unweighted data and gender-specific labour supply	Unweighted data and non-gender-specific labour supply	Change in regressors
	parameter estimates				difference in weighted means
Panel 1 – Based on log weekly wages					
Relative labour supply	-0.033	-0.014	0.029	0.022	0.150
Oil price	-0.595 ***	-0.591 ***	-0.451 *	-0.464 *	0.026
Housing starts	-0.384 *	-0.388 *	-0.460 **	-0.462 **	0.012
Computer and telecommunications	-0.026	-0.037	0.114	0.112	-0.381
Exchange rate	-0.232	-0.271	0.771	0.748	0.067
Minimum wages	0.087	0.093 †	0.074	0.074	0.155
Unionization	-0.548 **	-0.545 **	-0.844 ***	-0.855 ***	0.008
Relative unionization	-0.049	-0.052	-0.013	-0.014	0.035
Temporary jobs	-0.465 ***	-0.473 ***	-0.346 ***	-0.351 **	0.001
Unemployment rate of men aged 35 to 54	0.180	0.125	-0.287	-0.284	0.003
Panel 2 – Based on log hourly wages					
Relative labour supply	-0.039	-0.020	0.038	0.043	0.150
Oil price	-0.663 ***	-0.657 ***	-0.567 **	-0.585 **	0.026
Housing starts	-0.219	-0.225	-0.259 †	-0.262 †	0.012
Computer and telecommunications	-0.046	-0.058	0.065	0.058	-0.381
Exchange rate	-0.190	-0.224	0.601	0.530	0.067
Minimum wages	0.086 †	0.091 †	0.096	0.099 †	0.155
Unionization	-0.560 ***	-0.553 ***	-0.790 ***	-0.810 ***	0.008
Relative unionization	0.009	0.007	0.019	0.019	0.035
Temporary jobs	-0.371 ***	-0.379 ***	-0.257 **	-0.272 **	0.001
Unemployment rate of men aged 35 to 54	0.386	0.321	0.166	0.176	0.003

… not applicable

*** 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)

Note: Results from equation (2), based on 128 observations. P values are based on standard errors that allow for serial correlation of first order. The column labeled "Change in regressors" shows changes in the weighted means of the explanatory variables from the 2000-to-2002 period to the 2010-to-2012 period. All models include region indicators and year effects.

Source: Statistics Canada, Labour Force Survey.

Table 8
Wage differences — Regression results for women aged 20 to 34

	Weighted data and gender-specific labour supply	Weighted data and non-gender-specific labour supply	Unweighted data and gender-specific labour supply	Unweighted data and non-gender-specific labour supply	Change in regressors
	parameter estimates				difference in weighted means
Panel 1 – Based on log weekly wages					
Relative labour supply	-0.064 †	-0.098 *	-0.110 ***	-0.129 ***	0.359
Oil price	-1.988 ***	-2.022 ***	-1.566 **	-1.651 **	0.006
Housing starts	-2.760 †	-2.688 †	-1.719	-1.691	0.001
Computer and telecommunications	-0.003	0.029	0.176 †	0.184 †	-0.274
Exchange rate	-0.034	0.101	0.506	0.634	0.035
Minimum wages	-0.116 *	-0.124 *	-0.214 ***	-0.209 ***	0.159
Unionization	-0.111	-0.171	-0.067	-0.182	0.042
Relative unionization	-0.015	-0.005	0.069	0.081	0.029
Temporary jobs	-0.028	-0.007	-0.036	-0.046	-0.005
Unemployment rate of men aged 35 to 54	0.329	0.414	0.668	0.619	0.003
Panel 2 – Based on log hourly wages					
Relative labour supply	-0.085 *	-0.113 **	-0.105 ***	-0.121 ***	0.359
Oil price	-1.762 ***	-1.795 ***	-1.406 **	-1.483 **	0.006
Housing starts	-2.725 *	-2.611 *	-1.094	-1.072	0.001
Computer and telecommunications	0.037	0.072	0.193 *	0.200 *	-0.274
Exchange rate	-0.202	-0.065	0.275	0.391	0.035
Minimum wages	-0.139 **	-0.146 **	-0.208 ***	-0.203 ***	0.159
Unionization	-0.100	-0.183	-0.048	-0.159	0.042
Relative unionization	0.088	0.106	0.142 †	0.155 *	0.029
Temporary jobs	-0.014	0.011	-0.016	-0.024	-0.005
Unemployment rate of men aged 35 to 54	0.408	0.517	0.810 †	0.767 †	0.003

… not applicable

*** 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)

Note: Results from equation (2), based on 128 observations. P values are based on standard errors that allow for serial correlation of first order. The column labeled "Change in regressors" shows changes in the weighted means of the explanatory variables from the 2000-to-2002 period to the 2010-to-2012 period. All models include region indicators and year effects.

Source: Statistics Canada, Labour Force Survey.

The two panels of Table 7 show that, for young men, three variables are statistically significant at the 5% level in all models considered: the oil price variable, the unionization rate, and the temporary jobs variable.[12] Parameter estimates for the first and third variable are fairly stable, using either weighted or unweighted data. Parameter estimates for the unionization variable are notably higher when unweighted data are used. Nevertheless, all models suggest that these three variables tended to reduce wage differences between young male bachelor's degree holders and young male high school graduates during the 1997-to-2012 period.

Table 8 shows that the factors associated with the decline of the education wage premium for young women differ from those for young men. For both wage measures and for most models considered, increases in the relative supply of bachelor's degree holders, in oil prices and in real minimum wages are negatively correlated—at the 5% level—with changes in the education wage premium (Table 8).[13] Unlike young men, the unionization rate and the temporary jobs variable for young women are never statistically significant. While parameter estimates for minimum wages are higher in absolute value in unweighted regressions, the reverse is true for the oil price variable.

In sum, while the oil boom experienced during much of the 2000s tended to reduce the education wage premium for both sexes, the remaining contributing factors differed across gender. Together, the oil price variable, the unionization rate, and the temporary jobs variable accounted for a drop of between 2.0 and 2.2 log points in the education wage premium, i.e., for between 26% and 29% of the reduction in young men's education premium between 2000–2002 and 2010–2012 (Table 9). Increases in oil prices were the most important factor, accounting for roughly 20% of this reduction.[14] In contrast, rising relative supply of bachelor's degree holders, oil prices and real minimum wages accounted for between 47% and 94% of the reduction in young women's education premium. Movements in relative labour supply were generally dominant, accounting for between 39% and 45% of the reduction. Movements in minimum wages accounted for about one-third of this reduction; rising oil prices accounted for the remainder.[15]

12. The housing starts variable is statistically significant at the 5% level when results are based on log weekly wages but not when they are based on log hourly wages.
13. When results are based on log hourly wages, the housing starts variable is statistically significant at the 5% level with weighted regressions but not with unweighted regressions. The reverse is true for the computer and telecommunications variable.
14. Table 9 is based on weighted regressions. Using unweighted regressions, the oil price variable, the unionization rate, and the temporary jobs variable accounted for between 24% and 29% of the reduction in young men's education premium between 2000–2002 and 2010–2012. The oil price variable accounted for between 15% and 20% of this reduction.
15. With unweighted regressions, movements in relative labour supply and in minimum wages account for virtually the entire decline in the education wage premium for young women.

Table 9
Predicted changes in the education wage premium from 2000–2002 to 2010–2012

	Weighted data			
	Based on log weekly wages		Based on log hourly wages	
	Gender-specific labour supply	Non-gender-specific labour supply	Gender-specific labour supply	Non-gender-specific labour supply
	number			
Panel 1 – Men aged 20 to 34				
Relative labour supply	0.0000	0.0000	0.0000	0.0000
Oil price	-0.0153	-0.0152	-0.0171	-0.0169
Housing starts	-0.0047	-0.0048	0.0000	0.0000
Computer and telecommunications	0.0000	0.0000	0.0000	0.0000
Exchange rate	0.0000	0.0000	0.0000	0.0000
Minimum wages	0.0000	0.0000	0.0000	0.0000
Unionization	-0.0043	-0.0043	-0.0044	-0.0044
Relative unionization	0.0000	0.0000	0.0000	0.0000
Temporary jobs	-0.0006	-0.0006	-0.0004	-0.0005
Unemployment rate of men aged 35 to 54	0.0000	0.0000	0.0000	0.0000
Changes predicted by regressors statistically significant at 5% level	-0.0249	-0.0249	-0.0220	-0.0218
Changes in the education wage premium	-0.0771	-0.0771	-0.0756	-0.0756
	percent			
Percentage of observed changes predicted by statistically significant regressors	32	32	29	29
	number			
Panel 2 – Women aged 20 to 34				
Relative labour supply	0.0000	-0.0257	-0.0305	-0.0296
Oil price	-0.0123	-0.0125	-0.0109	-0.0111
Housing starts	0.0000	0.0000	-0.0036	-0.0034
Computer and telecommunications	0.0000	0.0000	0.0000	0.0000
Exchange rate	0.0000	0.0000	0.0000	0.0000
Minimum wages	-0.0184	-0.0197	-0.0220	-0.0232
Unionization	0.0000	0.0000	0.0000	0.0000
Relative unionization	0.0000	0.0000	0.0000	0.0000
Temporary jobs	0.0000	0.0000	0.0000	0.0000
Unemployment rate of men aged 35 to 54	0.0000	0.0000	0.0000	0.0000
Changes predicted by regressors statistically significant at 5% level	-0.0307	-0.0578	-0.0670	-0.0673
Changes in the education wage premium	-0.0656	-0.0656	-0.0679	-0.0679
	percent			
Percentage of observed changes predicted by statistically significant regressors	47	88	99	99

Note: The influence of regressors that are not statistically significant at the 5% level is set to zero. Numbers may not add up due to rounding.

Source: Statistics Canada, Labour Force Survey.

3.2 Differences in full-time paid employment rates

While wage differences between young bachelor's degree holders and high school graduates employed in full-time jobs narrowed from 2000–2002 to 2010–2012, differences in full-time paid employment rates widened. The widening amounted to 5.4 percentage points for young men and 6.0 percentage points for young women (Table 10). For both sexes, results from equation (2) indicate that higher unemployment rates among men aged 35 to 54 were generally associated with larger differences in full-time paid employment rates between young bachelor's degree holders and high school graduates. However, unemployment rates of men aged 35 to 54 increased by less than 1 percentage point between the two periods. As a result, movements in aggregate labour market conditions account for a marginal portion (no more than 7%) of the widening of differences in full-time paid employment rates across education levels.[16] The same qualitative conclusion holds when attention is restricted to young men and women who are not full-time students (Table 11).

16. This can be seen by multiplying the parameter estimates shown in Table 10 for the unemployment rate of men aged 35 to 54 by the change in the mean values of this variable from 2000–2002 to 2010–2012.

Table 10
Differences in full-time paid employment rates from 2000–2002 to 2010–2012 — Regression results

	Weighted data		Unweighted data		Change from 2000–2002 to 2010–2012
	Controlling for relative unionization	Not controlling for relative unionization	Controlling for relative unionization	Not controlling for relative unionization	
	parameter estimates				change in mean value
Panel 1 – Men aged 20 to 34					
Oil price	-0.221	-0.263	-0.197	-0.200	0.022
Housing starts	-0.132	-0.157	-0.203	-0.208 †	0.012
Computer and telecommunications	0.014	0.002	-0.009	-0.011	-0.368
Exchange rate	0.407	0.007	0.107	0.045	0.069
Minimum wages	0.079	0.053	-0.040	-0.051	0.156
Unionization	-0.339 †	…	-0.091	…	0.007
Relative unionization	-0.022	0.021	-0.054	-0.053	0.034
Unemployment rate of men aged 35 to 54	0.650 †	0.847 *	0.784 *	0.829 *	0.002
Full-time paid employment rate	…	…	…	…	0.054
Panel 2 – Women aged 20 to 34					
Oil price	0.085	0.242	0.007	0.319	0.006
Housing starts	0.067	0.389	-0.054	0.867	0.001
Computer and telecommunications	-0.042	0.002	-0.113	-0.032	-0.266
Exchange rate	1.120 *	1.614 ***	0.743	1.638 **	0.036
Minimum wages	0.123 *	0.125 *	0.089 †	0.093 †	0.157
Unionization	0.263 †	…	0.480 **	…	0.040
Relative unionization	-0.181 *	-0.148 *	-0.118	-0.034	0.028
Unemployment rate of men aged 35 to 54	0.979 **	0.909 *	1.560 ***	1.477 ***	0.003
Full-time paid employment rate	…	…	…	…	0.060

… not applicable

*** 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)

Note: Results from equation (2), based on 128 observations. P values are based on standard errors that allow for serial correlation of first order. All models include region indicators and year effects.

Source: Statistics Canada, Labour Force Survey.

Table 11
Differences in full-time paid employment rates from 2000–2002 to 2010–2012 (full-time students excluded) — Regression results

	Weighted data		Unweighted data		Change from 2000–2002 to 2010–2012
	Controlling for relative unionization	Not controlling for relative unionization	Controlling for relative unionization	Not controlling for relative unionization	
	parameter estimates				change in mean value
Panel 1 – Men aged 20 to 34					
Oil price	-0.160	-0.189	-0.163	-0.165	0.023
Housing starts	-0.084	-0.101	-0.189	-0.195 †	0.012
Computer and telecommunications	0.069	0.060	0.077	0.075	-0.370
Exchange rate	0.469	0.211	0.526	0.463	0.068
Minimum wages	0.054	0.038	-0.032	-0.043	0.155
Unionization	-0.215	…	-0.094	…	0.006
Relative unionization	0.066	0.092	0.014	0.015	0.034
Unemployment rate of men aged 35 to 54	0.676 †	0.807 *	0.800 *	0.845 *	0.002
Full-time paid employment rate	…	…	…	…	0.039
Panel 2 – Women aged 20 to 34					
Oil price	-0.048	0.214	-0.087	0.365	0.006
Housing starts variable	0.357	0.867	0.282	1.650	0.001
Computer and telecommunications	-0.078	-0.002	-0.120	0.004	-0.266
Exchange rate	0.654	1.531 **	0.431	1.807 **	0.035
Minimum wages	0.145 **	0.150 **	0.090 †	0.096 †	0.157
Unionization	0.488 **	…	0.766 ***	…	0.039
Relative unionization	-0.231 **	-0.168 *	-0.196 *	-0.063	0.028
Unemployment rate of men aged 35 to 54	0.987 *	0.857 *	1.662 ***	1.551 **	0.002
Full-time paid employment rate	…	…	…	…	0.039

… not applicable

*** 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)

Note: Results from equation (2), based on 128 observations. P values are based on standard errors that allow for serial correlation of first order. All models include region indicators and year effects.

Source: Statistics Canada, Labour Force Survey.

For young men, none of the other explanatory variables shown in Table 10 and Table 11 is, in a consistent way, statistically significant at the 5% or 10% level. This is not the case for young women. In all models considered and regardless of whether full-time students are excluded, rising real minimum wages are positively correlated with widening differences in full-time paid employment rates between young female bachelor's degree holders and young female high school graduates. The correlations are significant at the 5% or 1% level with weighted regressions and at the 10% level with unweighted regressions. Combined with the results shown in Table 8, this finding suggests that increases in real minimum wages had a dual impact

for young women in recent years: they tended to reduce wage differences seen across education levels in full-time jobs while widening differences in full-time paid employment rates. Multiplying the 16-log-point increase in (employment-weighted) real minimum wages observed between 2000–2002 and 2010–2012 by the parameter estimates shown in Table 10 suggests that increases in real minimum wages accounted for between one-quarter and one-third of the 6-percentage-point widening of the differences in full-time paid employment rates observed during this period.

Along with minimum wages, movements of the Canadian dollar on foreign exchange markets and movements in unionization rates—absolute or relative—were often associated with cross-educational differences in full-time paid employment rates for young women. In several models, the appreciation of the Canadian dollar is positively correlated with widening differences in employment rates between young female bachelor's degree holders and young female high school graduates. Such widening may have occurred if exchange rate appreciation—or changes in international trade patterns correlated with exchange rate appreciation—led to job losses in manufacturing industries, such as textiles and clothing, where young female high school graduates were employed more often than young female bachelor's degree holders.[17,18] Because the mean value of the exchange rate variable increased by 0.036 from 2000–2002 to 2010–2012, and since parameter estimates for the exchange rate variable equal at least 1 when using weighted versions of equation (2), weighted regressions suggest that the appreciating Canadian dollar might account for at least 60% ($0.036 \div 0.060$) of the widening of differences in full-time paid employment rates between young female bachelor's degree holders and young female high school graduates. Since evidence of a relationship between the exchange rate variable and full-time paid employment rates is not as strong when full-time students are excluded (see first two columns of Table 11), this finding must be interpreted with caution.

In most models, widening unionization differences between young female bachelor's degree holders and young female high school graduates were associated with narrowing differences in full-time paid employment rates. Conversely, rising overall unionization rates were associated with a widening of these differences. However, their combined contribution is limited. Together, they account for about one-tenth of the 6-percentage-point widening of the differences in full-time paid employment rates seen between 2000–2002 and 2010–2012 (Table 10).

3.3 Differences in unconditional average weekly earnings

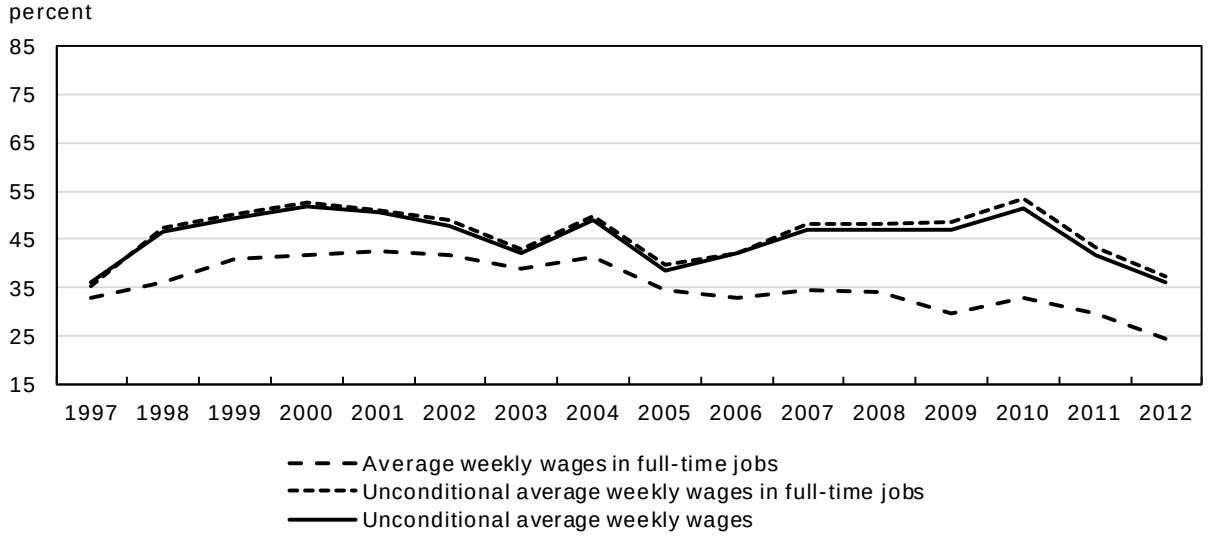
Since wage differences across education levels narrowed from the early 2000s to the early 2010s while differences in full-time paid employment rates widened, differences in unconditional average weekly earnings—which account for non-employment—might well have displayed no trend during this period.

Charts 9 and 10 assess this hypothesis.[19] Along with differences in average weekly wages earned in full-time jobs, these charts plot differences in unconditional average weekly wages in full-time jobs and differences in unconditional average weekly earnings. Unconditional average weekly wages in full-time jobs are defined as average weekly wages in full-time jobs times full-time paid employment rates. Unconditional average weekly earnings are a weighted average of mean weekly wages in full-time jobs and mean weekly wages in part-time jobs, with weights

17. Baggs et al. (2009) show that firm survival and sales are negatively associated with appreciations in the Canadian dollar.
18. From 2010 to 2012, 0.2% of young female high school graduates were employed in textiles, clothing and leather and allied products industries, down from 1.5% from 2000 to 2002. The corresponding percentages for young female bachelor's degree holders were 0.1% and 0.6%.
19. For simplicity, wage differences in full-time jobs do not control for workers' potential labour market experience. As a result, Charts 9 and 10 are not comparable to Charts 1 and 2.

equal to full-time and part-time paid employment rates, respectively. When unconditional average weekly earnings are computed, individuals who are not paid workers are assigned zero weekly earnings. While unconditional average weekly wages in full-time jobs capture movements in wage differences across education levels as well as movements in differences in full-time paid employment rates, unconditional average weekly earnings capture, in addition, the corresponding movements in part-time jobs as well as changes in non-employment.

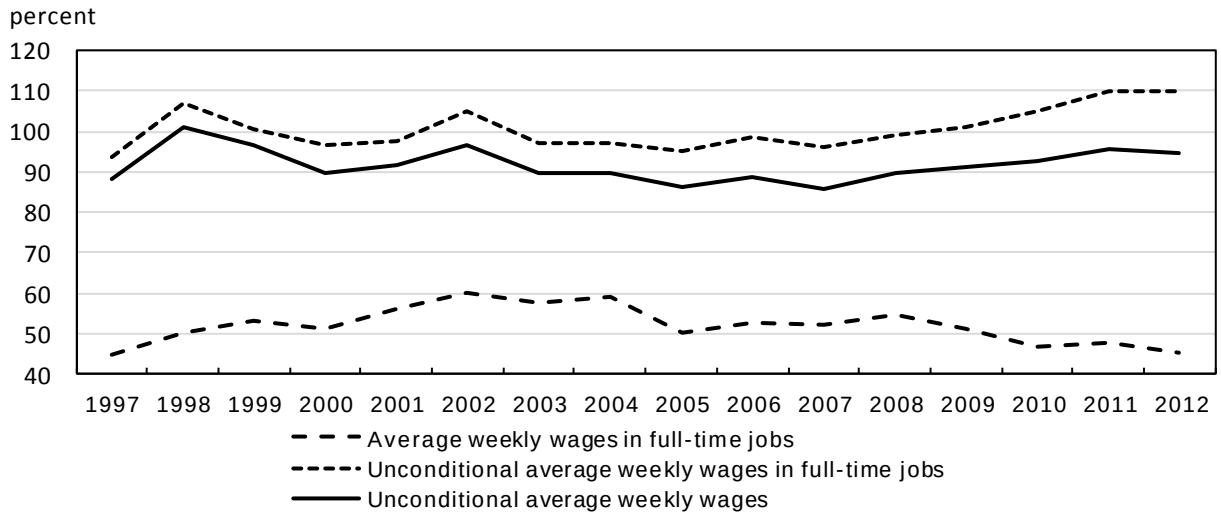
Chart 9
Differences in average unconditional weekly wages between male bachelor's degree holders and high school graduates aged 20 to 34, 1997 to 2012



Note: Contrary to Chart 1, differences in average weekly wages in full-time jobs are not adjusted for workers' potential labour market experience. Unconditional average weekly wages are a weighted average of mean weekly wages in full-time jobs and mean weekly wages in part-time jobs, with weights equal to full-time and part-time paid employment rates, respectively (individuals who are not paid workers are assigned zero weekly wages).

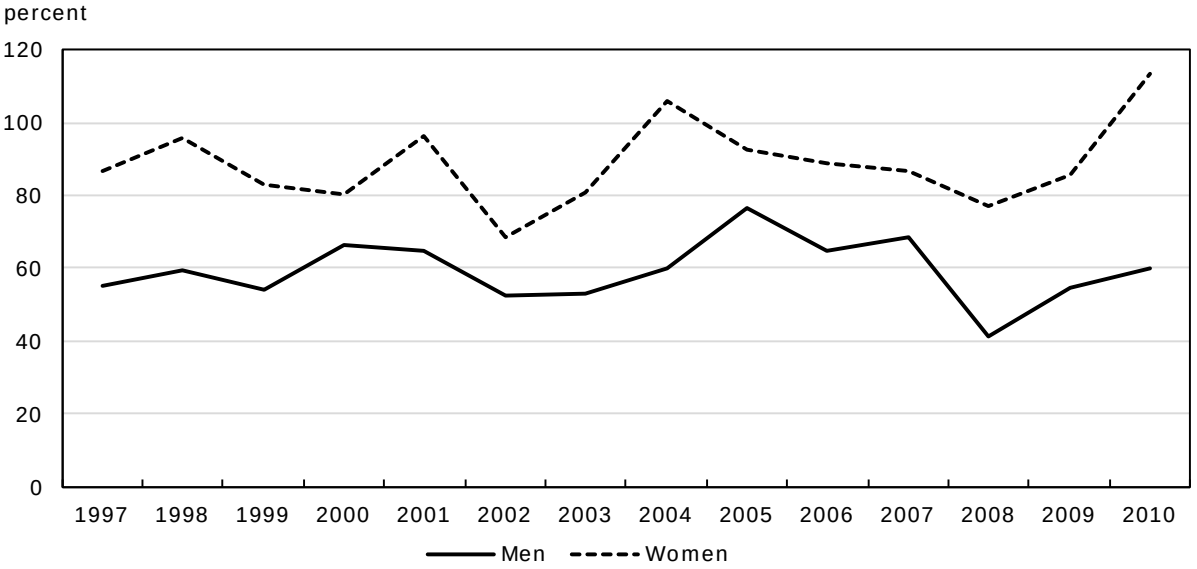
Source: Statistics Canada, Labour Force Survey.

Chart 10
Differences in average unconditional weekly wages between female bachelor's degree holders and high school graduates aged 20 to 34, 1997 to 2012



Note: Contrary to Chart 2, differences in average weekly wages in full-time jobs are not adjusted for workers' potential labour market experience. Unconditional average weekly wages are a weighted average of mean weekly wages in full-time jobs and mean weekly wages in part-time jobs, with weights equal to full-time and part-time paid employment rates, respectively (individuals who are not paid workers are assigned zero weekly wages).
Source: Statistics Canada, Labour Force Survey.

Chart 11
Differences in average annual wages and salaries between bachelor's degree holders and high school graduates aged 20 to 34, by sex, 1997 to 2010



Note: The sample consists of workers aged 20 to 34 who have a high school diploma or a bachelor's degree, did not attend school, college, CEGEP or university in the reference year, had positive wages and salaries and earned no more than $250,000 (in 2012 dollars) during the reference year.
Source: Statistics Canada, Survey of Labour and Income Dynamics.

The results confirm the aforementioned hypothesis. While cross-educational wage differences in full-time jobs trended downwards from 2002 to 2010, neither unconditional average weekly wages in full-time jobs nor unconditional average weekly earnings trended downwards during that period (Charts 9 and 10). Chart 11 indicates that differences in average annual wages and salaries—as measured from the Survey of Labour and Income Dynamics (SLID)—also display no downward trend during that period.[20] Together, these results imply that analyses of cross-educational earnings differences based solely on annual wages and salaries would fail to identify the two offsetting movements documented in this study: a narrowing of wage differences in full-time jobs and a widening of differences in full-time paid employment rates.

4 Conclusion

From 1980 to 2000, wage differences between bachelor's degree holders and high school graduates employed in full-time jobs widened in Canada (Boudarbat et al. 2010). These differences subsequently narrowed during the 2000s for young workers (Morissette et al. 2013). As wage differences between young bachelor's degree holders and high school graduates narrowed, differences in full-time paid employment rates between the two groups widened. Using consistent employment, wage and education data from the LFS, this study has examined which factors account for the narrowing of the wage differences seen in recent years and for the widening of differences in full-time paid employment rates.

To do so, the study takes advantage of the fact that wage differences across education levels and several key explanatory variables evolved differently across regions from 1997 to 2012. For example, the education wage premium for young men narrowed much more in Alberta and Saskatchewan than in other provinces. Real minimum wages rose substantially in the Atlantic provinces but fell in British Columbia. Using this cross-regional variation in the evolution of youth outcomes and key regressors, the study asks, among others, the following question: did provinces that experienced the largest increase in wage premium-reducing factors display the most pronounced narrowing in wage differences across education levels?

The study uncovers three key findings. The first is that, while the increases in world oil prices experienced during much of the 2000s tended to reduce the education wage premium for both young men and young women, the remaining contributing factors differed between genders. Increases in real minimum wages and in the relative supply of bachelor's degree holders were important for young women but not for young men. Movements in unionization rates and in the relative importance of temporary jobs affected the education wage premium for young men but not for young women.

Second, movements in real minimum wages appear to have had a dual impact for young women. While rising real minimum wages were associated with narrowing wage differences across education levels, they were also associated with a widening of differences in full-time paid employment rates. This result highlights the possibility that institutional changes may have differentiated impacts on workers' outcomes, i.e., modifying the wage and employment structure in dissimilar ways.

The third finding is that the narrowing of wage differences between young bachelor's degree holders and high school graduates employed in full-time jobs was offset by a widening of differences in full-time paid employment rates between these two education groups. As a result, differences in unconditional average weekly earnings or in average annual wages and salaries between young bachelor's degree holders and high school graduates displayed no trend during

20. The SLID sample consists of individuals aged 20 to 34 who: a) have a high school diploma or a bachelor's degree; b) did not attend school, college, CEGEP or university in the reference year; c) had positive wages and salaries during the reference year; and d) did not earn more than $250,000 (in 2012 dollars).

the observation period. This finding is important since it informs discussions on earnings inequality between these two education groups. It shows that while between-group inequality in annual wages and salaries displayed no trend during the 2000s, between-group inequality in hourly wages (or weekly wages) fell as a result of several factors including movements in oil prices, increases in real minimum wages and relative labour supply effects. In sum, after rising from 1980 to 2000, cross-educational differences in the price of labour actually fell for young workers during the 2000s.

Appendix

This appendix describes how the labour demand variables used in this study are constructed.

Oil price variable in year t : this variable equals the industrial product price index for petroleum and coal products in year $t-1$ times the percentage of full-time male (female) workers aged 20 to 34 who were employed in the oil industry in a given region during the 1997-to-1999 period.[21]

Housing starts variable in year t *:* this variable describes the number of housing starts in a given region in year $t-1$—relative to their average in 2002—multiplied by the proportion of full-time male (female) workers aged 20 to 34 who were employed in the construction industry in a given region during the 1997-to-1999 period.[22]

Exchange rate variable in year t *:* this variable equals the number of U.S. dollars per Canadian dollar in year $t-1$ times the proportion of full-time male (female) workers aged 20 to 34 who were employed in manufacturing in a given region during the 1997-to-1999 period. The exchange rate numbers are annual averages of noon spot exchange rates: they are obtained from CANSIM table 176-0064.

Computer and telecommunications (CT) variable in year t [23]*:* this variable equals the number of full-time male (female) workers aged 20 to 34 employed in CT in year $t-1$ times the percentage of male (female) workers aged 20 to 34 who were employed in CT in a given region r during the 1997-to-1999 period.

21. Oil prices are obtained from CANSIM table 329-0065 and are indexed to 2002 = 100. Petroleum accounts for approximately 95% of petroleum and coal products. We compute the fraction of young workers who are employed in one of the following 4-digit North American Industry Classification System (NAICS) 2007 industries: Oil and gas extraction (2111), Coal mining (2121), Support activities for mining and oil and gas extraction (2131), and Utility system construction (2371).
22. Housing starts are obtained from CANSIM table 027-0029 and include all housing units. This variable also varies by region.
23. Following Bowlby and Langlois (2002), computer and telecommunications (CT) industries include the following 4-digit NAICS 2007 industries: Commercial and service industry machinery manufacturing (3333), Computer and peripheral equipment manufacturing (3341), Communications equipment manufacturing (3342), Audio and video equipment manufacturing (3343), Semiconductor and other electronic component manufacturing (3344), Navigational, measuring, medical and control instruments manufacturing (3345), Computer and communications equipment and supplies merchant wholesalers (4173), Software publishers (5112), Telecommunications (5171 to 5179), Data processing, hosting, and related services (5182), Computer systems design and related services (5415), and Electronic and precision equipment repair and maintenance (8112).

Table 12
Percentage of high school graduates and bachelor's degree holders employed in specific industries, by province, 2010-to-2012 average

	Computer and telecommunications	Construction	Manufacturing	Oil industry
		percent		
Panel 1 – Men aged 20 to 34				
Newfoundland and Labrador	3.8	13.2	5.4	5.5
Other Atlantic provinces	5.5	9.7	12.8	2.0
Quebec	10.1	7.1	18.1	0.6
Ontario	8.2	9.9	16.7	0.6
Manitoba	2.7	11.2	16.8	1.8
Saskatchewan	3.2	13.6	10.0	9.4
Alberta	3.8	13.3	9.5	14.2
British Columbia	6.2	14.3	10.3	2.6
All provinces	6.9	10.8	14.4	3.6
Panel 2 – Women aged 20 to 34				
Newfoundland and Labrador	1.7	1.4	1.5	1.7
Other Atlantic provinces	2.7	0.8	3.8	0.4
Quebec	3.5	0.8	7.8	0.2
Ontario	3.8	1.4	8.1	0.0
Manitoba	1.5	1.1	6.6	0.2
Saskatchewan	1.6	1.8	3.5	1.0
Alberta	1.5	3.0	3.6	5.7
British Columbia	2.8	1.9	5.3	0.3
All provinces	3.0	1.5	6.5	1.0

Note: Full-time paid w orkers aged 20 to 34.

Source: Statistics Canada, Labour Force Survey.

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