

POST-SECONDARY EDUCATION IN CANADA:
Returns to University, College and Trades Education

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Abstract

By international standards, the level of educational attainment in Canada is exceptionally high, with the proportion of adult Canadians holding post-secondary educational certificates being more than twice the OECD average. This remarkable ranking is primarily the result of high participation in non-university post-secondary educational sectors: colleges, trades institutions, and other vocational educators. While the non-university PSE sector is clearly important in terms of both the quantity and the qualitative nature of human capital it produces, it has received very little attention in the academic literature, which has tended to focus on the outcomes of university graduates. This paper uses Census data from 1981 to 1996 to examine the evolution of the earnings premia to college and trades education over a twenty year period of rapid economic change. Examining this evolution is a prerequisite to understanding the behaviour of participation in the various post-secondary education streams.

I. INTRODUCTION

By international standards, the level of educational attainment in Canada is exceptionally high. Fifty-two percent of the adult population has a completed post-secondary certificate, more than twice the average among OECD countries. Canada lags behind the U.S. in terms of the proportion of the population with a university degree however (although it does exceed the OECD average in this regard) and its high ranking in overall post-secondary attainment is more the result of a remarkably high participation in non-university post-secondary education.

The non-university post-secondary education (PSE) sector is comprised of community colleges, trades institutions, and other vocational educators. While certainly a heterogeneous mix, there is a commonality in that the sector responds to the vocational training needs of the labour market, with very close ties between curriculum and the production of occupation-specific skills. In an economy of rapidly emerging technologies, colleges have a qualitative importance in delivering necessary skills to the labour market as primary suppliers of technologists. Understanding participation in trades education is of considerable importance as shortages of skilled tradespeople have become acute in some trades. Specialized skill sets, lengthy training and apprenticeship programs, and (in many cases) regulatory barriers to entry preclude labour substitution in the short run and localized trades shortages have the potential to create economy-wide difficulties.

Despite its significance, the non-university PSE sector has received very little attention from labour market analysts, with academic research usually focussed on the university sector. Thus, there is a considerable literature estimating the returns to university education in Canada, the possible role of these returns in income inequality, and so on, but little is known about the outcomes of college and trades graduates and how those outcomes have evolved over the past two decades of significant labour market change. For example, we have very little information on the dynamics of the returns to trades education that would assist in diagnosing the skilled trades shortages problem. This paper uses Census data from 1981 through 1996 to investigate the evolution of the educational premium to college and trades education over a twenty year period of rapid economic and social change. Determining the income premium to each of the three types of PSE over the option of no education beyond high school is a prerequisite to understanding the behaviour of participation. To the extent that potential students make choices between post-secondary avenues (in the sense that there is substitutability between them), it is important to compare these premia across the alternative PSE streams. In this way, we might determine whether the relative premia respond to changes in the mix of labour market needs, thereby providing correct signals to the supply side of the skilled labour market.

We find that trades certification generates fairly low earnings gains compared to high school graduates, and only when coupled with completed high school. The premium associated with a completed college diploma is appreciably larger but still less than half and often as little as a third of the earnings advantage associated with university completion at the Bachelor's level. Trades certification produces larger gains for men than it does for women, but the reverse is true for college diplomas and Bachelor's degrees. With a higher rate of growth in the earnings premium associated with a university degree among men over the 1980 to 1995 period, the male premium, while still less than that for women, has been closing the gender gap. Growth in the earnings gap over high school completion is particularly evident for younger workers. A puzzling feature of these returns is that those individuals who combine more than one credential appear not to benefit from the additional human capital. Thus, males with both a college diploma and a university degree experience a smaller earnings premium than do men who hold only a university degree.

In the following section, we provide an international comparison of educational attainment in the labour force and survey the literature relevant to returns to post-secondary education in Canada. Section III describes the data and variable constructions used in our estimates. Our methodology is outlined in Section IV, which also contains the results of the earnings gap estimates. Conclusions are presented in Section V.

II. BACKGROUND AND PREVIOUS LITERATURE

Table 1 documents the exceptional degree of educational attainment in the adult Canadian labour force by providing comparisons to other OECD countries. Out of the thirty countries in the OECD, the table lists the distribution of the labour force across four educational categories for the top seven countries in terms of total post-secondary education. Germany and France are added as notable references. As previously noted, the percentage of the labour force with post-secondary education is twice as high in Canada as the OECD average and almost 30 percent higher than the next ranked country, the U.S.. The role of the non-university PSE sector becomes clear when university and non-university attainments are separated. In fact, the proportion of the Canadian adult labour force with a university degree is only two-thirds that in the U.S. and less than 30 percent higher than the OECD average. The real source of Canadian performance in labour force educational attainment is the non-university post-secondary sector.

	Less than Upper Secondary	Upper Secondary Graduate	Non-University Post-Secondary	University Graduate	Total Post- Secondary
Canada	14	28	36	22	58
United States	9	50	10	31	41
Ireland	35	23	25	17	42
New Zealand	20	41	23	15	38
Iceland	35	29	16	20	36
Japan	15	49	14	22	36
Finland	21	43	19	17	36
Germany	13	54	16	16	32
France	31	43	13	13	26
OECD Average	29	42	12	17	29

source: OECD (2002)

The strong positive relationship between educational attainment and labour market earnings is a finding so consistent and universal across developed countries as to constitute a stylized fact. This stylized fact for university graduates has been well documented in a number of Canadian studies¹. The following discusses those studies that address the issues of returns to schooling across the different PSE sectors and possibly changes in these returns over time. In all of the studies cited, the “returns to schooling” are estimated using the Human Capital Earnings Function (HCEF) approach of estimating the impact on log earnings of additional schooling, which equals the internal rate of return to education only under the strict conditions outlined by Mincer (1976).

Using the Survey of Consumer Finances, Riddell (1995) finds that the annual earnings of each education group with high school education or more have risen from the early 1980’s through 1992 when compared to individuals who have completed only elementary school. The premium for those with a post-secondary certificate or diploma rose from about 25 to over 40 percent. The university wage premium is considerably higher at 90 to 120 percent of the elementary school wage, but the average earnings gap between university graduates and non-university post-secondary graduates has remained constant over the period. Riddell also finds that the earnings premium associated with program completion has risen in the Canadian labour market, with the earnings of those with a post-secondary certificate or diploma and of those with a university degree rising relative to individuals with an incomplete post-secondary education.

Ferrer and Riddell (2002) examine these sheepskin effects more closely, using 1996 Census data. They find that the marginal effect on weekly earnings of a college diploma or trades certificate over high school completion is 5 percent for men and 3 percent for women. This compares to an effect of 21 percent for both genders of a bachelor's degree.² An interesting finding is that, while non-university PSE program completion yields a positive return in addition to the return associated with the additional years of schooling required (i.e. a

1 . See, for example, Vaillancourt and Bourdeau-Primeau (2002), and Emery (2004) for summaries of Canadian results.

positive sheepskin effect), individuals with both a college diploma or trades certificate and a university degree tend to have lower average earnings than those with a university degree only. Ferrer and Riddell also conclude that both years of schooling and credentials are important, independent determinants of earnings. They reject both the standard Mincer HCEF which models earnings as a function only of years of schooling and the credentialist model in which earnings are a function only of degrees or certificates received.

Canadian evidence of lower earnings premia for non-university PSE compared to university graduates is consistent with American findings. Indeed, earlier American work on community college payoffs was generally negative (Breneman and Nelson (1981), Grubb (1993)). More recent analysis which takes greater care in measuring correlates (especially experience) is more positive.³ For example, each year of credit at a community college produces a 5 to 8 percent increase in annual earnings, a range of values very similar to, but still lower than, the returns to a four year baccalaureate.

It should be noted that these findings of payoffs to non-university PSE are based on earnings premia estimated using a HCEF approach. Boothby and Rowe (2002) use simulated lifetime earnings streams to estimate rates of return and find a median return to a Bachelor's degree of 12 percent for men and 13 percent for women. Returns to college diplomas were 16 percent and 18 percent for men and women, respectively. The reversal occurs primarily because of the lower investment costs of college diplomas, which are typically earned in a shorter period of time.

III. DATA

The primary data sources for this paper are the Censuses from 1981 through 1996. While somewhat sparse in terms of correlates, and deficient in good instruments that could be used to address the endogeneity issues of earnings equations, Census data provide the large sample sizes required for analysis of earnings by educational attainment and program type.

2. Returns to weekly earnings are likely to be lower than returns to annual earnings for those with PSE since the latter would incorporate the higher employment rates that are also positively related to higher education.

The data also offer detailed information on the type of educational certification obtained by individuals and years of schooling. While the earnings equation estimates must certainly be subject to selection bias, our interest lies more in changes in the wage premia over time than in levels at any point in time and, to the extent that the biases are constant, they difference out in year to year comparisons.

Educational Categories

While the principal focus of this paper is on individuals who have selected non-university postsecondary education and training, outcomes for all post-secondary educational categories will be estimated. Throughout the following, the base educational category will be the class of individuals whose highest educational attainment is completed high school. Individuals failing to complete high school and degree holders above a Bachelor's degree are removed from the sample.

Categorization of the sample is not a straightforward matter. Census data identify all certificates, diplomas, and degrees held by an individual as well as the highest level of schooling attended, permitting a long list of combinations of educational attainment.⁴ For example, it is possible to distinguish individuals who have completed high school and trades certification from those who have a trade certificate but did not complete high school. For either group, one can also separate those who undertook no further training or education from those who did so but did not complete certification beyond the trades certificate. In addition, some individuals combined different types of post-secondary education, holding, for example, both a trades certificate and a college diploma or, in a few cases, a trades certificate, a college diploma, and a bachelor's degree.

Based on preliminary analysis of labour market outcomes, occupational destinations, and major fields of study, the following categories of educational attainment were selected:⁵ high

3 . Kane, T., C. Rouse (1999), "The Community College: Educating Students at the Margin Between College and Work", *The Journal of Economic Perspectives*, Vol. 13, No. 1, pp. 63-84 contains an excellent summary of American research on community colleges.

4 . Unfortunately, for individuals holding multiple certificates timing cannot be identified.

5 . Individuals with university degrees beyond a Bachelor's were excluded, as were individuals whose only post-secondary attainment was a university diploma below a Bachelor's. A description of the data is provided in Table A1 of the Appendix.

school completion, trade certification without high school completion, trade certification with completed high school, college diploma, both trade certification and college diploma, Bachelor's degree only, Bachelor's degree and trade certification, and Bachelor's degree and college diploma. Very few individuals in the data held all three types of certification and do not represent a population of significant interest. Table 2 provides a breakdown of educational attainment among full-time, paid workers by gender.⁶ These shares are reported for young workers between the ages of 21 and 30 to capture recent trends.

	1980	1985	1990	1995
<i>Males</i>				
Trade w/o High School	24.2%	21.2%	15.9%	11.5%
Trade with High School	18.3	18.0	21.2	19.5
College	28.1	29.6	28.1	31.2
Bachelor's	20.4	19.8	21.1	24.0
Trade plus College	5.3	5.9	8.2	7.4
Trade plus Bachelor's	0.3	0.5	0.6	0.7
College plus Bachelor's	3.3	5.0	5.0	5.8
<i>Females</i>				
Trade w/o High School	11.7%	9.9%	7.8%	5.1%
Trade with High School	12.4	13.0	14.0	10.7
College	49.2	46.4	42.0	42.2
Bachelor's	20.0	20.7	22.7	27.7
Trade plus College	2.2	4.6	6.4	5.9
Trade plus Bachelor's	0.5	0.5	0.6	0.7
College plus Bachelor's	4.0	4.9	6.5	7.7

Source: Authors' calculations based on Census, PUMF files on Individuals, 1981 to 1996

Table 2 illustrates again the importance of non-university paths for those in the labour force who have chosen to pursue post-secondary education. Among young male workers, only slightly more than 30 percent hold a Bachelor's degree in 1995, either alone or in combination with other PSE certification. While this number has increased significantly from the 24 percent of young males holding a Bachelor's degree in 1980, the growth is even more pronounced for young female workers. For this group, the percentage with a Bachelor's degree has grown from 24 percent in the first year to more than 36 percent in 1995. For both genders, however, it remains true that college and trades education account

6 . Given the special role of colleges in Quebec, these shares were also calculated with Quebec

for a much larger proportion of post-secondary educational attainment than do universities. The largest changes for both genders have been in trades education where the share of young workers holding only a trades certificate has fallen dramatically over the 15 year period. Some of this decline has occurred as individuals combine a trades certificate with a college diploma or, to a much lesser extent, with a university degree. For men, however, there is a clear shift in favour of colleges and universities among those achieving a PSE. For women, the shift is to universities, with the share of both trades and college education declining.

There have been, then, changes in choices about post-secondary educational streams that are significant given the fairly short time frame covered in Table 2. We now turn to an examination of the economic returns to the individual PSE streams to determine if changing relative returns can explain the patterns reported in Table 2.

IV. EMPIRICAL METHODOLOGY AND RESULTS

In this section, ordinary least squares estimates of a log-wage human capital earnings function (HCEF) are used to develop weekly earnings differentials associated with higher levels of education.⁷ In all cases that follow, these differentials use as a reference class individuals whose highest level of education is completed high school. Within the class of log earnings HCEF's, a wide variety of specifications is available, ranging from the parsimonious Mincer years of schooling equation, to a multiple treatments model, and various combinations thereof. Riddell and Ferrer (2002) have recently argued in favour of a HCEF that includes both years of schooling and binary indicators for completion of diplomas, certificates, or degrees.⁸ After some experimentation⁹, we have settled on the hybrid credentialism/years of schooling HCEF:

residents excluded. As expected, the share of college attainment was smaller, but only slightly.

7. This concept of educational wage premia is obviously related to, but distinct from, the true financial returns to education. See Heckman et al., (2003).

8. Kane and Rouse (1995) similarly use a HCEF that includes both credential and a measure of years of schooling.

9. When the mean levels of schooling within each educational category are used in computing wage premia from the regression results, the wage gaps are fairly robust to specification.

$$\ln W = \beta_0 + \beta_1 EXP + \beta_2 EXP^2 + D\gamma + S\delta + X\phi + u \quad (1)$$

where W is the weekly wage, calculated as annual earnings divided by annual weeks of work; EXP is the number of years of potential experience, calculated as age - years of schooling - 6;

D is a vector of binary indicator variables, one for each of the educational classes listed above (except for completed high school);

S is vector of years of schooling, separated by years of primary and secondary, years of university post-secondary, and years of non-university post-secondary; and,

X is a vector of controls, including province of residence, marital status, indicators for large and medium city residence, visible minority status, aboriginal status, and unilingual status.¹⁰

Table 3 reports regression results for full-time, full-year paid workers.¹¹ Note that the sample now includes all working age individuals.

The hybrid specification renders the coefficients in Table 3 somewhat difficult to interpret. In order to estimate, say, the earnings premium for a Bachelor's degree over completed high school, account must be taken not only of the coefficient on the Bachelor's degree indicator but also of the mean differences in years of education between the two groups. In other words, the usual partial derivative interpretation of the value of the coefficient as indicating the effect of the degree holding all other variables (including years of education) is simply not tenable in this application. We must take account of the difference in mean years of education between the two groups and the earnings effect of this difference. Once this is done, the log earnings differences are too large to comfortably admit the usual interpretation

10. Controls for visible minority and aboriginal status are not available in the 1981 Census.

11. To highlight the main findings, coefficient estimates for the control variables are not reported. They are available upon request from the authors.

Table 3
Regression Results: All Workers

	Males				Females			
	1980	1985	1990	1995	1980	1985	1990	1995
Exp	.0402 (.0013)	.0480 (.0014)	.0433 (.0005)	.0467 (.0006)	.0283 (.0015)	.0409 (.0016)	.0370 (.0006)	.0439 (.0006)
ExpSq	-.0007 (.00003)	-.0008 (.00003)	-.0007 (.00001)	-.0008 (.00001)	-.0005 (.00004)	-.0007 (.00004)	-.0007 (.00001)	-.0008 (.00001)
Trade w/o HS	.0421 (.0132)	.0385 (.0145)	.0445 (.0054)	.0623 (.0063)	-.0146 (.0192)	-.0036 (.0213)	-.0050 (.0078)	-.0244 (.0090)
Trade with HS	.0458 (.0146)	.0528 (.0154)	.0720 (.0050)	.0789 (.0057)	-.0182 (.0204)	.0019 (.0217)	.0133 (.0068)	-.0027 (.0074)
College Diploma	.0419 (.0147)	.0870 (.0153)	.0930 (.0055)	.0896 (.0060)	.0337 (.0161)	.0966 (.0168)	.0899 (.0058)	.0926 (.0060)
Trade & College	.0768 (.0219)	.0886 (.0216)	.0863 (.0073)	.0783 (.0079)	.0864 (.0415)	.0740 (.0336)	.0597 (.0095)	.0554 (.0098)
Bachelor's Degree	.1944 (.0244)	.2001 (.0256)	.2026 (.0086)	.2192 (.0099)	.2513 (.0328)	.2474 (.0336)	.2191 (.0106)	.2206 (.0108)
Bachelor's & Trade	.0784 (.0606)	.0812 (.0631)	.0943 (.0192)	.0523 (.0219)	.0492 (.0819)	.1508 (.0771)	.1199 (.0254)	.1289 (.0259)
Bachelor's & College	.1578 (.0345)	.1797 (.0339)	.1739 (.0114)	.1837 (.0124)	.214 (.0428)	.2054 (.0417)	.1982 (.0129)	.1738 (.0128)
Yrs Primary plus Secondary	.0245 (.0033)	.0301 (.0041)	.0303 (.0015)	.0323 (.0018)	.0392 (.0057)	.0431 (.0061)	.0468 (.0021)	.0400 (.0022)
Yrs of nonuniversity	.0208 (.0029)	.0174 (.0031)	.0188 (.0011)	.0225 (.0013)	.0447 (.0045)	.0287 (.0045)	.0345 (.0015)	.0348 (.0016)
Yrs of university	.0203 (.0044)	.0324 (.0046)	.0290 (.0015)	.0300 (.0018)	.0388 (.0060)	.0472 (.0062)	.0463 (.0020)	.0490 (.0020)
Constant	5.130 (.0447)	5.247 (.0539)	5.524 (.0198)	5.491 (.0229)	4.731 (.0734)	4.849 (.0779)	5.113 (.0271)	5.215 (.0282)
Obs.	9824	10065	89313	82636	5558	6347	63779	61182
R ²	0.27	0.31	0.26	0.25	0.23	0.26	0.22	0.24

as a percentage wage difference so Table 4 reports exact percentage wage premia for each educational group over completed high school.¹² A visual representation is provided in Figure 1.

12. For any PSE category i , the percentage premium is calculated as $100 * (\exp(\hat{\gamma}_i + \bar{S}_i \hat{\delta}) - 1)$

Table 4
 Percentage Earnings Premia (compared to completed high school) All Workers

	Males				Females			
	1980	1985	1990	1995	1980	1985	1990	1995
Trade w/o HS	2.0%	0.6%*	1.4%	4.3%	-0.1%*	-2.5%*	-2.2%	-3.8%
Trade with HS	7.4	7.8	10.0	11.4	4.7	3.5*	5.0	3.5
College	10.8	15.1	16.2	16.9	15.6	18.8	20.1	20.2
Trade & College	14.0	14.0	14.9	15.3	23.0	15.3	16.4	16.5
Bachelor's	35.9	44.6	42.3	45.8	58.3	63.4	58.1	60.4
Bachelor's & Trade	23.7	29.6	30.0	25.9	34.5	49.9	46.9	51.3
Bachelor's & College	34.4	43.2	41.7	44.8	62.3	59.7	61.0	59.2

* insignificant at the 10% level

Earnings premia for males exhibit expected patterns among those with single credentials, with the largest premia accruing to those with the largest human capital investment. Trades education has only a marginal impact on earnings for those not completing high school a positive earnings impact for men when combined with high school completion, but one which is well below that provided by a college diploma. The premium attached to such a diploma is, in turn, less than half of the earnings gap generated by a university degree. The earnings gains for multiple certificate holders are more puzzling. For example, men holding both a trades certificate and a college diploma earn less than do men who hold only a college diploma. The apparent earnings depressing impacts of a trade certificate are even more evident for those who combine such a certificate with a university degree. Combining a university degree with a college diploma does not decrease the earnings gap over high school completers compared to those holding only a university degree, but neither does it increase the gap by an amount that would seem to be needed to justify the investment cost of additional certification.

Earnings premia over high school for women follow broadly similar patterns. Trades certification produces the lowest earnings gaps. Indeed, there appears to be no earnings benefit compared to high school completers in three of the four census years. College diplomas and university degrees do generate appreciably higher earnings, with the usual

outcome that women benefit more from higher education than do men. Once again, combining trades education with either a college diploma or university degree actually reduces the earnings premium and holding both a diploma and a degree has an unexpectedly small payoff.

The finding that holding multiple credentials does not add to earnings (and in most cases depresses earnings) is at odds with a simple human capital model in which individual productivity differs only with the size of the investment.¹³ Ferrer and Riddell (2002), who report similar findings on multiple credential holders, argue that those individuals with multiple credentials may have lower (unobserved) ability compared to individuals with a single credential at the highest level of the former. Thus, for example, an individual who combines a trades certificate with a college diploma may not be strategically combining complementary educational programs. Rather, this individual may initially have faced barriers to the successful completion of the higher credential that become more surmountable after having completed the trades program. They would then be less able, on average, than individuals who enter the higher program initially, a possibility recognized by employers. While a plausible explanation, our inability to observe the sequence in which the credentials are obtained in Census data precludes an empirical examination of this issue.

Earnings premia for males exhibit substantial upward trends in each of the three primary streams, trade, college, and university, with the largest proportionate increase occurring for those with trades education. This general upward tendency is consistent with the view that the educational premium has been increasing in the 1980's and 1990's, as discussed in Riddell (1995). The story is different for women, however. Trades certification appears to have had little or no impact on earnings over high school completers and certainly no trend appears in Table 4. The earnings benefits of continuing on to a college diploma has increased for women, but by a smaller margin that is the case for men. The earnings premia for women holding a university degree, either alone or in combination with a college diploma, exhibits the starkest contrast with the results for men. In the fifteen years from

13. It also casts considerable doubt on the most parsimonious HCEF specifications which include only years of schooling as the measure of human capital stock. As well, it brings into question the wisdom of public policies being pursued by some provinces to promote the movement of students between colleges and universities.

1980 to 1995, earnings for university educated women have not increased at all in relation to high school completers and, in fact, have fallen for those who also have a college diploma. If there is an increased labour demand for individuals with advanced skills, it would seem that the astonishing increase in the supply of university education women over this time period has prevented any price effects from occurring.

Results with Quebec Excluded

To this point, the various post-secondary streams have been treated as distinct pathways in the sense that individuals combining college diplomas with university degrees have been implicitly regarded as having invested in two different types of human capital. If each type has currency in the labour market, there is naturally some surprise when their combination fails to produce compensation greater than that accorded to a university degree alone. The nature of the college system in Quebec is quite different, however. College graduation from a CEGEP is normally required for entry into the university system and, for these graduates, we would expect a premium no greater than that achieved by university graduates without a college diploma in other provinces. Our finding of no earnings premium reward for combining a college diploma with a university degree might then simply reflect the fact that this particular combination of PSE credentials is much more prevalent in Quebec. Our sample of holders of this combination of credentials would then be dominated by graduates of the Quebec PSE system wherein there is no reward for such a combination.

Census data do not report the province in which post-secondary education was undertaken. However, we have re-estimated the earnings premia for each of the Census years on samples which exclude residents of Quebec and on samples that include only residents of Quebec. The estimated percentage earnings premia for the educational credentials most affect by the college issue are reported in Table 5.¹⁴

In almost all cases, the earnings premia are larger in Quebec than outside the province although some of the patterns from the national sample are preserved. University premia

14. Regression results are available from the authors.

Table 5
 Percentage Earnings Premia: **Excluding** Quebec

	Males				Females			
	1980	1985	1990	1995	1980	1985	1990	1995
College	8.5%	14.5%	14.1%	14.4%	12.2%	15.4%	18.4%	18.7%
Bachelor's	33.9	43.1	40.6	44.2	54.9	61.8	56.9	58.4
Bachelor's & College	33.3	43.9	37.3	40.8	66.5	59.6	61.1	53.1

Percentage Earnings Premia: Only Quebec								
	1980	1985	1990	1995	1980	1985	1990	1995
College	16.3	15.6	21.9	23.7	26.2	27.4	26.0	24.5
Bachelor's	43.1	52.4	48.0	51.5	72.6	65.2	61.1	66.9
Bachelor's & College	35.8	40.3	47.3	51.1	55.9	60.2	63.1	69.2

All estimates significant at the 5% level

are considerably larger than those for college graduation, women achieve higher earnings gains from PSE than men, and the premia for men are increasing more so than is the case for women. The primary issue is, however, the relationship between the premium associated with a combination of university and college and that associated with university alone and how that relationship differs in Quebec. On this issue, the data are puzzling. If the combination of college and university graduation is a signal of lower ability, as proposed in Ferrer and Riddell (2002), we expect to observe an earnings premium for the combination that is lower than that for a university diploma alone. If, on the other hand, colleges have the role of preparing students for universities, the premia for both categories should be similar.

If we consider 1990 and 1995 only, the earnings gaps for men appear to be consistent with what we would expect from a CEGEP system in Quebec. Men with both a college diploma and a university degree experience the same earnings premium as those with only a university degree. Outside of Quebec, the results would appear to support the notion that colleges and universities are distinct PSE paths and that holding multiple credentials signals below average ability. The results for 1980 and 1985, however, are reversed with multiple credential holders in Quebec earning less than men with a university degree only, and multiple credential holders outside Quebec earning the same. Note also that, in Quebec, the

earnings premium for joint diploma/degree holders among women has overtaken that associated with a degree alone. We interpret the patterns among both men and women in Quebec as reflecting the emergence of the CEGEP system in the 1970's as feeders for the university system, replacing the distinct role of colleges in that province prior to this change. We are unable, however, to explain the patterns outside Quebec.

Results for Younger Workers

Some studies have emphasized the difference in the educational premium across age groups. Card and Lemieux (2001), for example, find that the university wage premium over high school completion has increased for younger men relative to older Canadian men. Bar-Or et. al. (1995) report similar findings (although they use experience instead of age). The interplay between the returns to education and to experience is an important piece of the income distribution puzzle, but we may also be interested in the earnings gaps of younger workers in attempting to understand choices made about which PSE stream to pursue. To the extent that these choices are guided by financial benefits, earnings differences immediately after graduation are more influential simply because they are discounted much less than earnings later in the working career.

Table 6 reports estimates of the percentage wage premia over high school graduation for younger workers, ages 25 to 34. Trends are graphically presented in Figure 2.¹⁵ The educational earnings premia for younger men do, in fact, show a greater growth than is the case for the entire working age population of men, and this is true across all PSE categories. In particular, the premium for college completion among males grew by about 56 percent for the whole sample but more than doubled for younger males. Similarly, albeit less dramatically, the premium for university completion increased by 28 percent for all males compared to almost 50 percent for younger males.

15. Once again, the regression results are available from the authors.

Table 6
Percentage Earnings Premia: Ages 25-34

	Males				Females			
	1980	1985	1990	1995	1980	1985	1990	1995
Trade w/o HS	4.9%	1.5%*	4.1%	4.5%	-1.8%*	3.3%*	-4.3%	-2.0%*
Trade with HS	8.1	10.2	12.9	14.0	7.2	1.7*	3.6	4.7
College	8.9	11.2	17.8	19.2	16.7	15.5	20.9	21.9
Trade & College	16.7	11.1	18.6	20.6	8.3*	14.0	17.8	17.6
Bachelor's	31.2	39.2	40.4	46.4	53.8	54.8	54.7	59.9
Bachelor's & Trade	27.9	18.3	33.2	38.7	36.6	36.2	38.9	54.1
Bachelor's & College	35.2	39.4	42.4	46.2	51.1	51.5	55.5	57.5

* insignificant at the 10% level

Higher rates of increase in educational premia are also evident for women in some cases. From Table 4, the increase in the earnings gap for female college graduates in the labour force increased from 15.6 percent to 20.2 percent from 1980 to 1995. Among younger women, the gap increased from 16.7 percent to 21.9 percent, resulting in an almost identical proportional increase. However, the earnings gap for university graduates shows a larger growth among younger female workers than for the larger sample and, whereas the premium for a combination of university degree and college diploma fell in the larger population, it increased for younger females. The earnings gap for women combining trades certification with high school graduation continues to fall for younger women. In all cases, while the premia tend to grow more for younger women than for the entire female labour force, this growth tends to be lower than is the case for men. For younger men as for the larger sample, their gains from educational investments are growing closer to those for women.

V. Program Differences

Focussing attention on mean wage differentials across educational categories may obscure an underlying variation of wages within the categories that may be meaningful. In particular, given the diversity of programs within each of the broad categories used thus far, there is a danger that the level of aggregation is too high. This is particularly true for the college and

trade PSE sectors each of which produces graduates with widely different skill sets. It may therefore be interesting to consider returns to the various educational streams at a more disaggregated level. Considering program by program differences will also be useful in understanding changes in the wage premia for different educational streams. For example, changes in the university to high school premium may reflect a general increase in returns to university programs, changes in only a subset of those programs, or a change in the composition of university graduates by program even if no underlying changes are taking place in program-specific premia.

Disaggregated programs are defined by the major field of study in the individual's highest postsecondary degree, diploma or certificate.¹⁶ To make reporting manageable, the sample is restricted to only those individuals with a trades certification plus completed high school, or with a single certification from a college, or university institution. The reference group continues to be all high school completers. Small cell problems require some aggregation of the detailed fields available in the Census data (details are provided in the appendix) to the following groups: Arts, Business, Sciences, Engineering, and Health. Estimates using the Census major field of study group "Other" fail to produce significant estimates and are not reported.

Earnings premium estimates for the trades groups are plagued by lack of statistical significance and it is difficult to make general comments about trades. There does seem to be, however, a considerable variation in the earnings gaps across major fields of study and, particularly for women, it appears that trades certification reduces earnings in some fields.

The earnings premia for male college graduates have increased moderately in the arts, business and engineering fields and have fallen slightly in the health field. The earnings gap of 8.3 percent found in 1985 has disappeared. Recall from Table 4 that the net effect of all changes was an increase in the premium of slightly less than 2 percentage points from 1985 to 1995. Male Bachelor's degree holders similarly experienced only a very modest growth in

16. This information is not available in the 1981 Census.

Table 7
Percentage Earnings Premia: By Major Field of Study

		Males			Females		
Field		1985	1990	1995	1985	1990	1995
Trade with HS	Arts	2.6%*	2.1%*	1.9%*	-8.2%	-4.4%	-8.5%
	Business	-2.9*	2.7	7.4	2.9*	7.8	5.9
	Science	-8.5*	-7.8	-5.4	-19.4	-6.9	-8.3
	Engineering	9.7	11.7	12.6	11.7*	13.9	11.8
	Health	27.5	10.0	2.8*	26.1	13.3	12.1
College	Arts	7.4	9.2	8.7	12.8	13.3	13.0
	Business	12.9	16.1	15.2	9.1	15.3	16.6
	Science	8.3	3.1	0.7*	16.9	14.5	15.7
	Engineering	17.0	20.7	21.9	20.8	28.7	27.5
	Health	15.3	11.7	14.8	45.3	35.3	35.0
Bachelor's	Arts	30.7	28.9	33.0	57.6	53.6	56.0
	Business	45.0	43.6	48.9	52.5	55.1	58.3
	Science	44.4	38.5	44.3	67.1	53.7	59.5
	Engineering	65.6	60.5	58.7	64.9	79.8	65.2
	Health	41.8	32.6	46.2	84.0	73.6	76.4

* insignificant at the 10% level

the overall earnings premium over that period but, unlike their college diploma counterparts, experienced a temporary dip in the premium in 1990. Table 7 illustrates that this drop in the premium in 1990 was experienced by Bachelor's degree holders across all major fields of study. By 1995, all fields except engineering had recovered to exceed 1985 premia.

Program-specific returns exhibit much more interesting patterns for women. Note first the significant decline in earnings premia for health related fields of study across all three educational categories. Males with high school completed and trades certification were subject to a similar decline in this field but male college and university graduates were not. The decline in the premium in the health field was more than offset by strong growth in business and engineering related fields to produce the increase in the overall premium to college reported for women in Table 4. Recall also from that table that the overall Bachelor's degree premium for women fell from 1985 to 1995. As was the case for men, this premium fell from 1985 to 1990 and, while there was some recovery to 1995, it was not sufficiently large to return to the premium to its 1985 level. In Table 7, the only field of study showing real growth in the Bachelor's earnings gap is business related studies, with

engineering more or less holding its own. Given the predominance of arts related fields among university women, the moderate decline in the earnings gap for this group cannot be offset by the strong growth in the business fields.

VI. CONCLUSION

Canada's exceptional performance in labour force skills acquisition, relative to other countries, is largely due to the human capital investments its workers make in post-secondary education outside universities. We have found an earnings premium for those with completed college diplomas that is approximately one third of that associated with completion of a Bachelor's degree, for both men and women. At first glance, these observations would appear to be inconsistent with the implicit view that choices between the different PSE streams are guided by rates of return. It is important, however, to recall the distinction between an earnings premium and the rate of return to the educational investment. With the costs of earning a college diploma considerably lower than those associated with a university degree, the difference in rates of return would be smaller and, in principle, could be reversed.¹⁷ Even so, we suspect that high college attainment in the face of lower earnings premia reflects heterogeneity in individual-specific returns that is not accounted for in our OLS approach.

Completion of a trades certificate is associated with only small gains in earnings, particularly for those without completed high school and for women. While there has been modest growth in the trades earnings premium for men from 1985 to 1995, current labour market shortages in the skilled trades sectors should not be surprising in light of these results. What is interesting, and worthy of further research, is the question of why the earnings premium for trades education appears not to respond to such market imbalances.

In 1980, the combination of a college diploma with a trades certificate produced an earnings premium larger than that associated with either certificate alone. Since 1985, however, this has been reversed in the case of college graduates, who show a higher earnings gap than their counterparts possessing a trades certificate as well. A similar pattern is evident when

17. On this point, see Boothby and Rowe (2002).

comparing men with a Bachelor's degree to men with both a Bachelor's degree and a college diploma. The story for women is somewhat more mixed, but there certainly is no evidence that the rewards to multiple credentials would justify the additional investment. The interpretation of these findings is that multiple credential holders tend to be individuals who have revised their human capital investment strategies part way through the educational system.

Men have seen an increase in the earnings premium to all educational paths, especially younger men. The growth for women has been more muted. It is generally agreed that increases in earnings inequality in Canada have been dampened by large increases in the supply of highly educated labour, depressing the educational earnings premium more so than has been the case in the U.S.. The extraordinary increase in post-secondary education by women appears to have had a similar effect, depressing the growth in the earnings gap compared to men.

Given the high rate of technological change and the need to seek comparative advantage in knowledge-intensive sectors, the importance of post-secondary education to economic prosperity is widely understood. What is much less well-known are the specific roles played by the individual components of the post-secondary educational sector in generating human capital, how relative returns respond to changes in labour market needs, and how individuals, in turn, respond to such changes when making choices among trades, colleges, and universities. An examination of the earnings premia across the educational categories and the evolution of these premia over time is a prerequisite to exploring these issues. It also serves to highlight the large number of questions that need to be addressed before we can understand the large and complex Canadian post-secondary education sector.

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Figure 1a Earnings Premia, Males

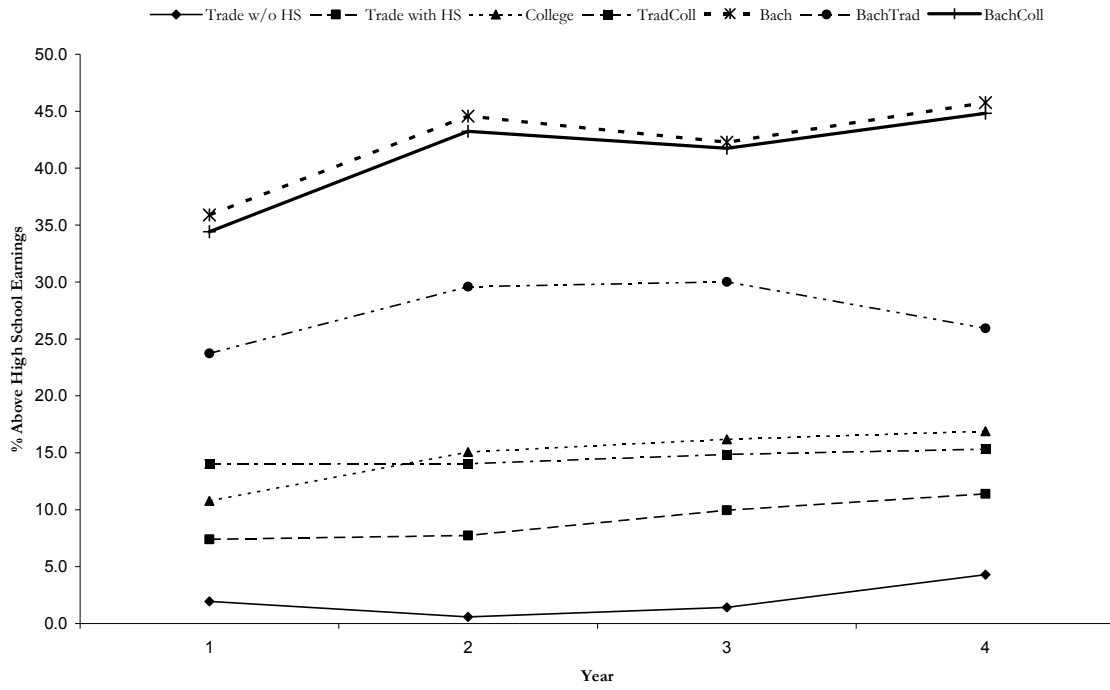


Figure 1b Earnings Premia, Females

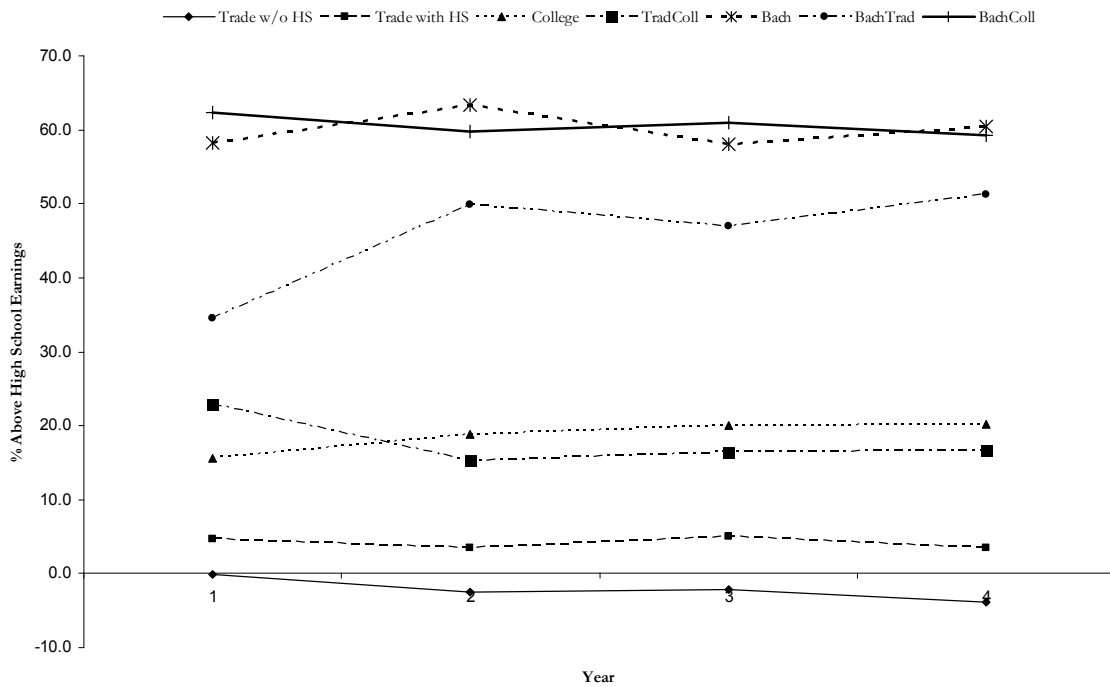


Figure 2a Earnings Premia, Males Ages 25-34

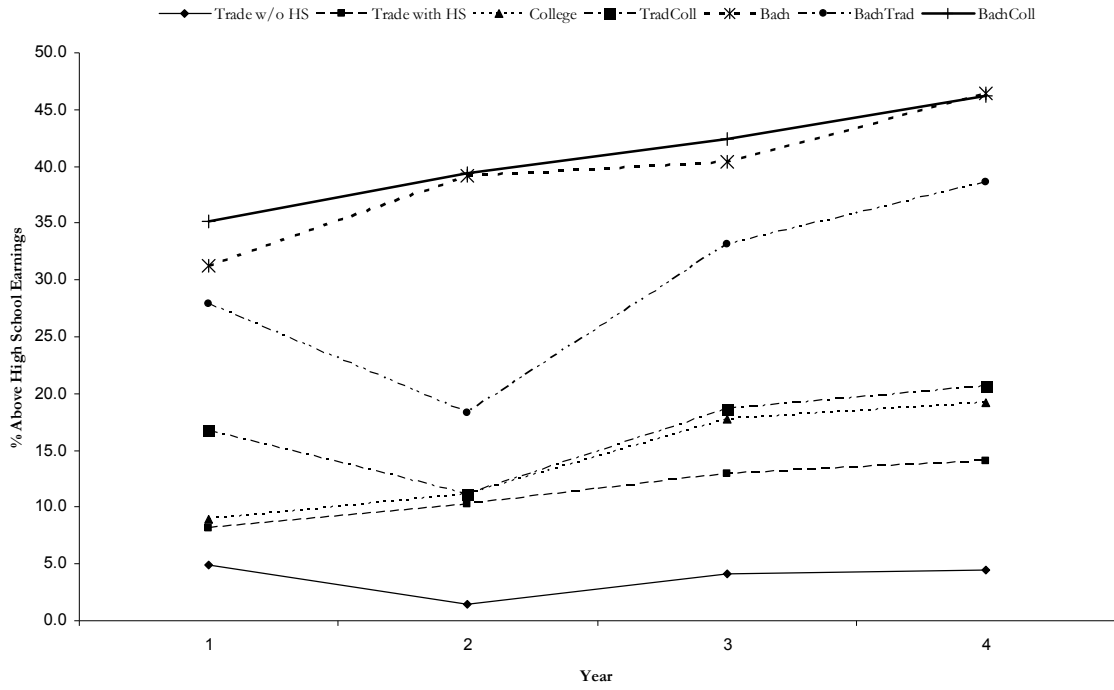
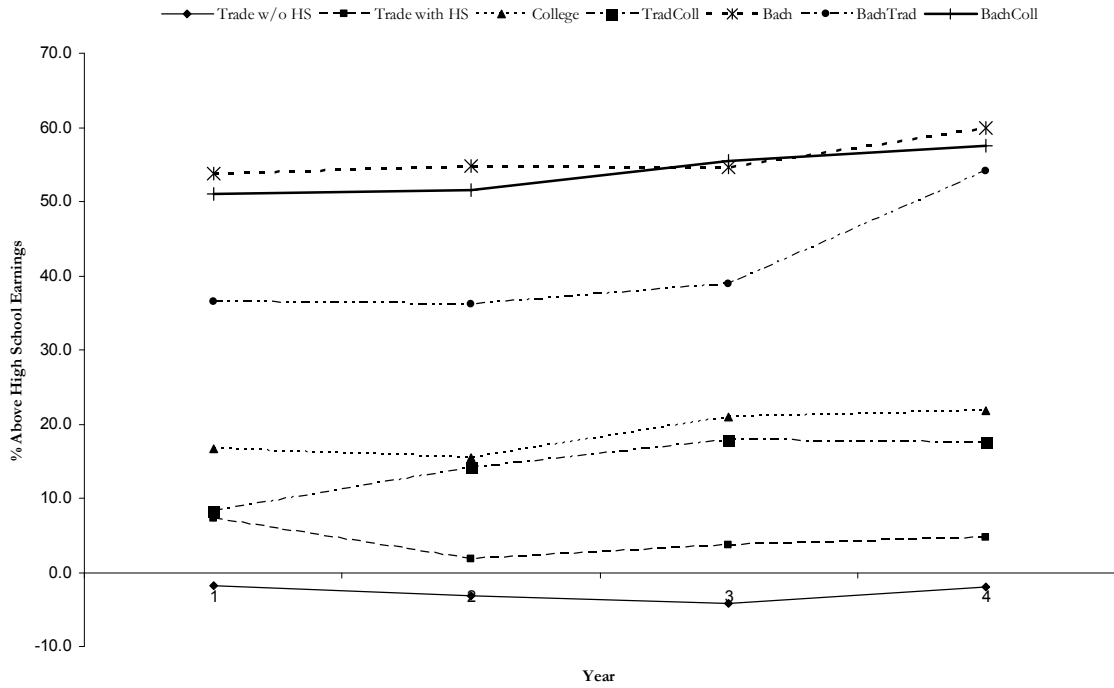


Figure 2a Earnings Premia, Females Ages 25-34



APPENDIX

Table A1: Sample Means (selected variables)

	Men				Women			
	1980	1985	1990	1995	1980	1985	1990	1995
Age	35.1	35.9	36.8	38.2	32.6	33.7	35.8	37.9
Hrs. of Work	43.0	43.3	43.2	44.4	39.0	39.7	39.6	40.2
HS*	.362	.359	.356	.335	.443	.413	.409	.362
Trade w/o HS*	.201	.167	.134	.113	.094	.147	.060	.047
Trade w. HS*	.106	.105	.138	.133	.074	.078	.080	.073
College*	.141	.148	.146	.172	.253	.251	.241	.276
College & Trade*	.043	.052	.058	.067	.015	.028	.043	.044
Bachelor's*	.121	.133	.130	.138	.092	.124	.124	.147
Bachelor's & Trade*	.005	.005	.007	.007	.004	.005	.005	.005
Bachelor's & College*	.020	.027	.029	.035	.022	.029	.037	.045
Total Yrs. of School	13.6	13.7	13.9	14.0	13.3	13.7	13.8	14.1
Yrs. of primary and secondary	11.6	11.8	11.9	12.0	11.9	12.0	12.1	12.1
Yrs. of non-university (if >0)								
Yrs. of university (if > 0)	2.9				2.6			
Experience	15.7	16.2	17.0	18.2	13.3	14.1	16.0	17.8
Weekly Wage	434.63	599.49	764.48	835.41	288.8	411.03	536.43	609.73

* Means of 0,1 binary indicators

Table A2: Educational Categories

Category	Major Field of Study, 1996 Census
Arts	Educational, Recreational and Counselling Services Fine and Applied Arts Humanities and Related Fields Social Sciences and Related Fields
Business	Business and Commerce Financial Management Industrial and Institutional Management and Administration Marketing, Merchandizing, Retailing and Sales Secretarial Science
Science	Agricultural and Biological Sciences/Technologies Mathematics and Physical Sciences
Engineering	Engineering and Applied Sciences Building Technologies Data Processing and Computer Science Technologies Electronic and Electrical Technologies Other Engineering and Applied Science Technologies and Trades
Health	Nursing Other Health Professions, Sciences and Technologies